



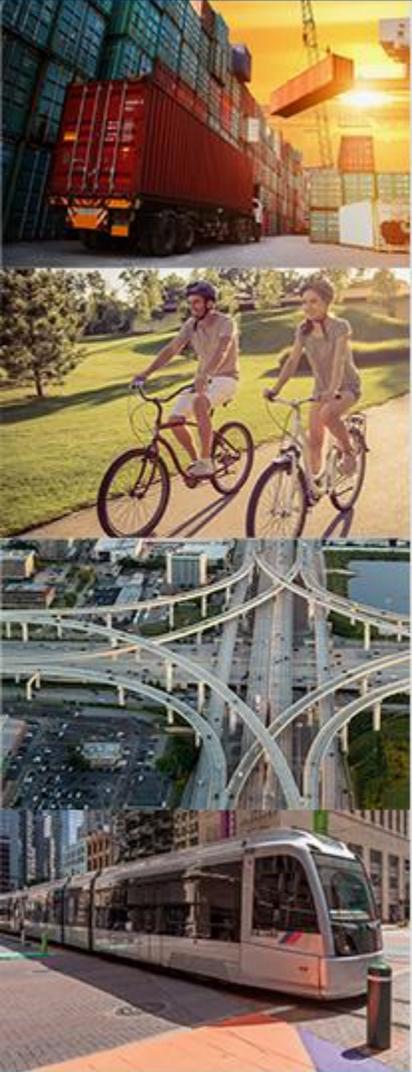
High Capacity Transit Task Force



January 25, 2019

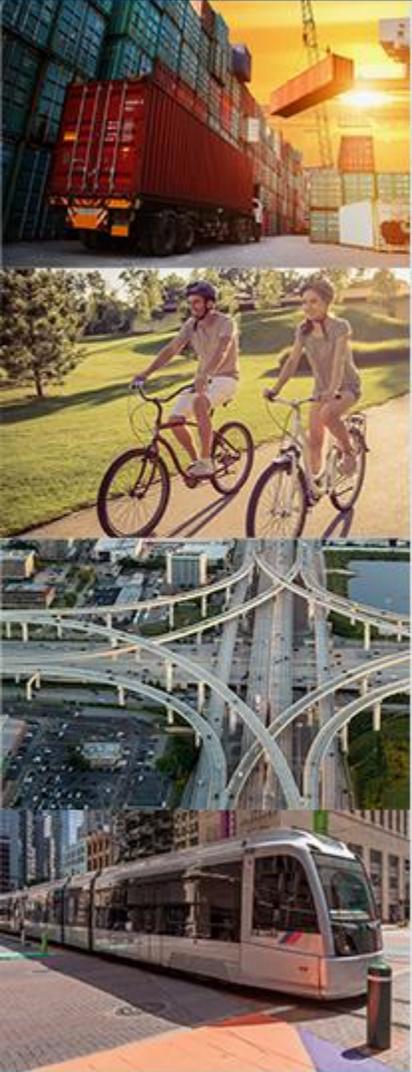


Today's Agenda



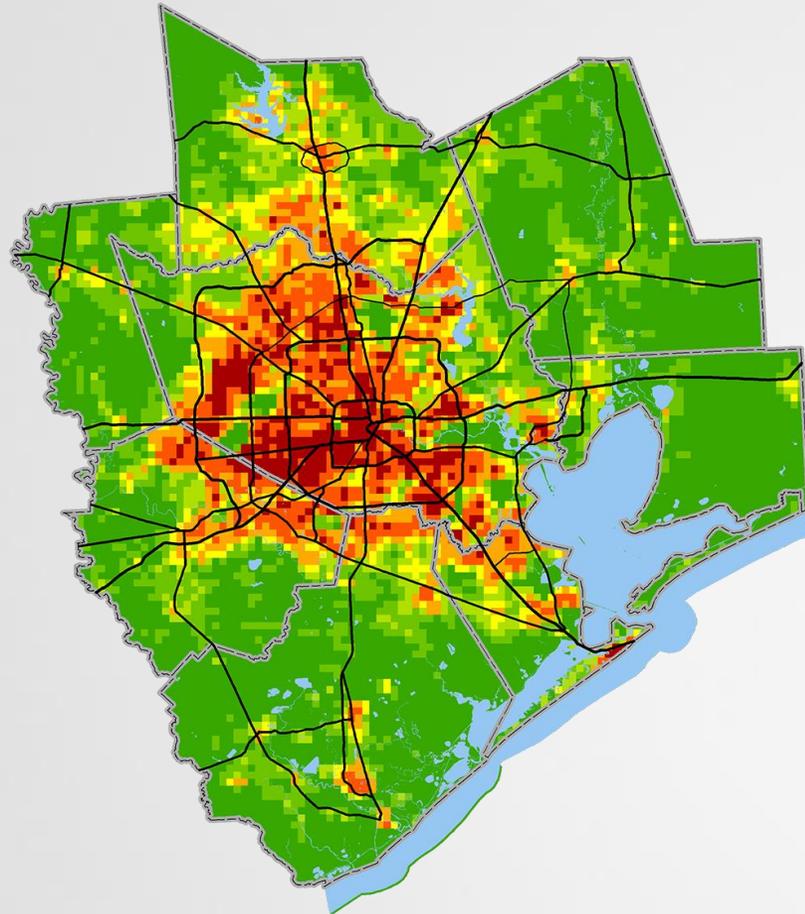
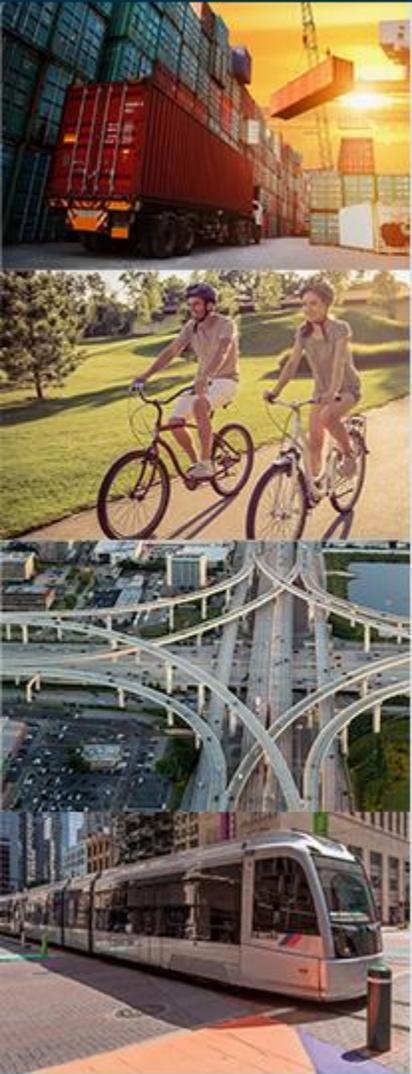
- Introductions
- Public Comment
- Workgroup Reports:
 - Service Concepts
 - Innovative Finance
 - Economic Development
- Next Steps

Public Comment

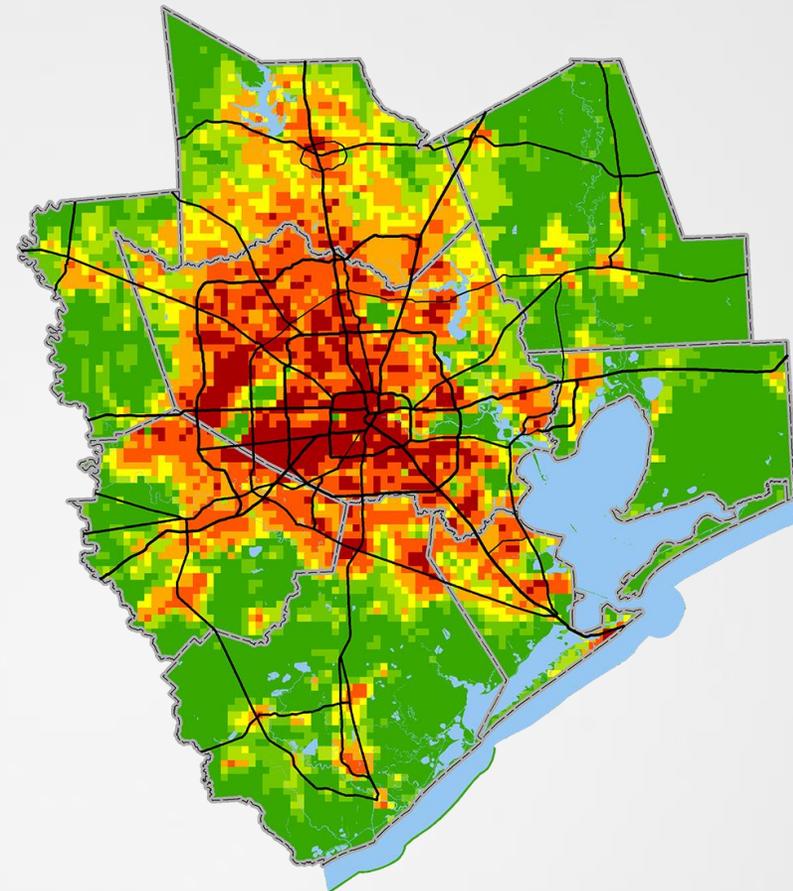


Please limit your remarks to three minutes. Thank you!

Population Growth

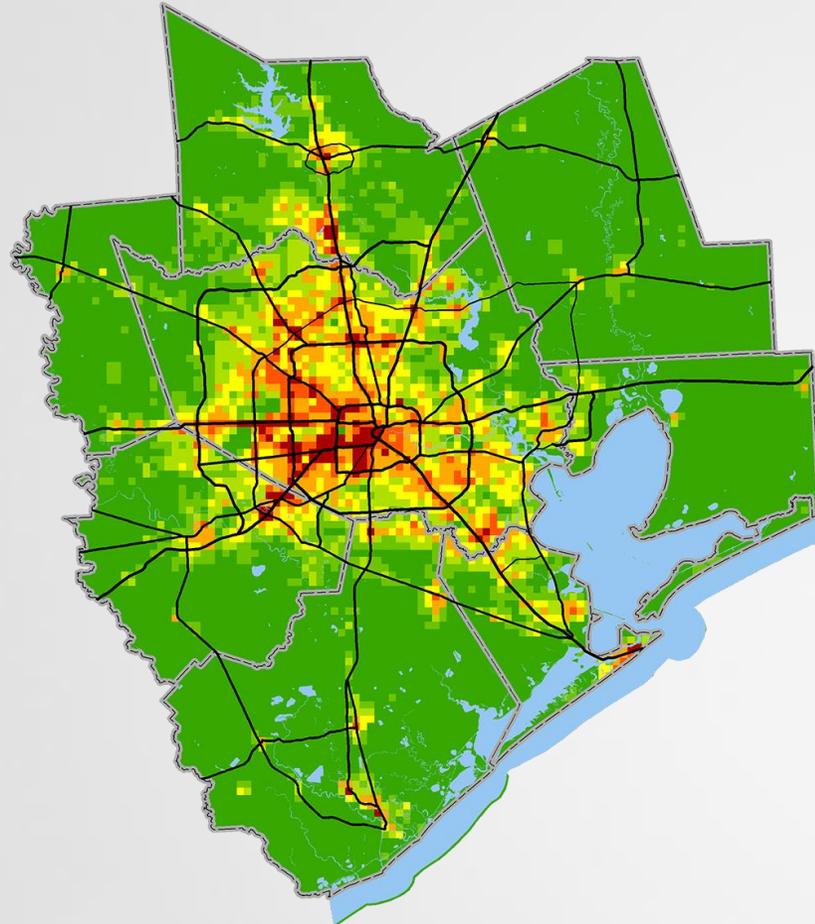
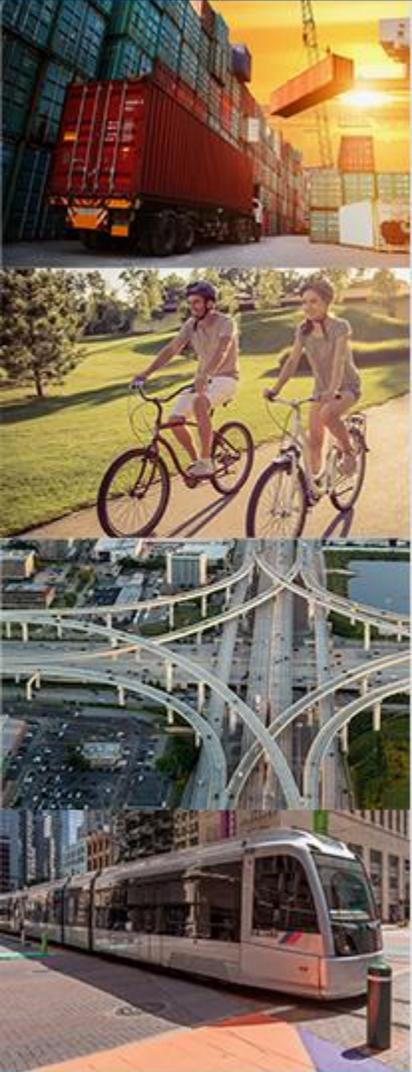


2017

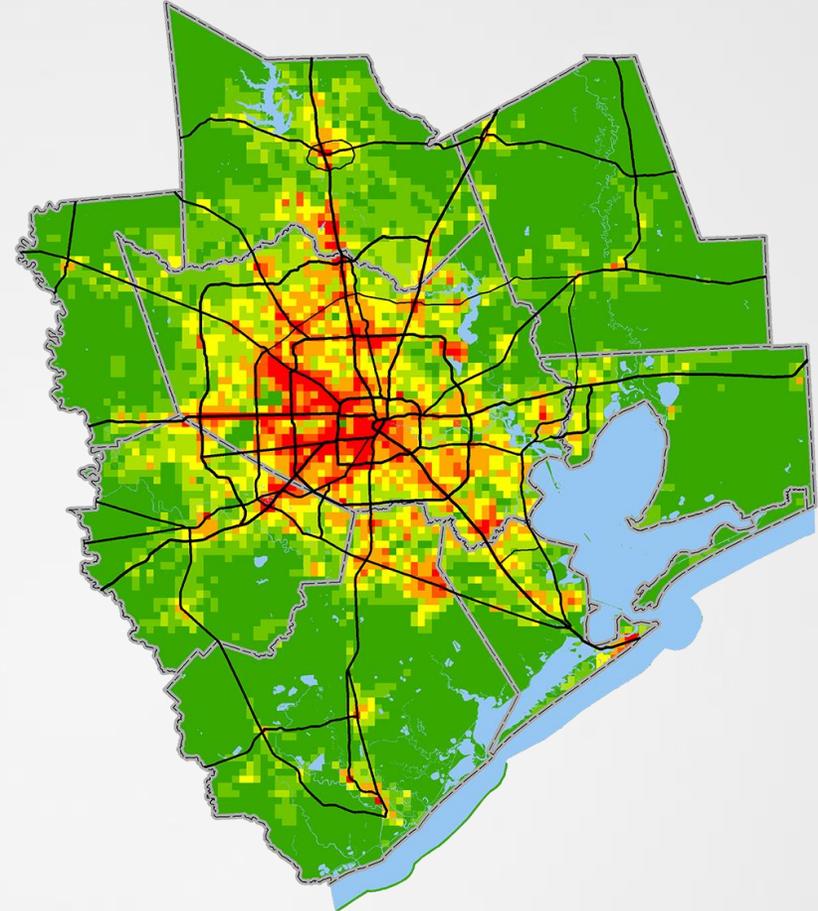


2045

Employment Growth



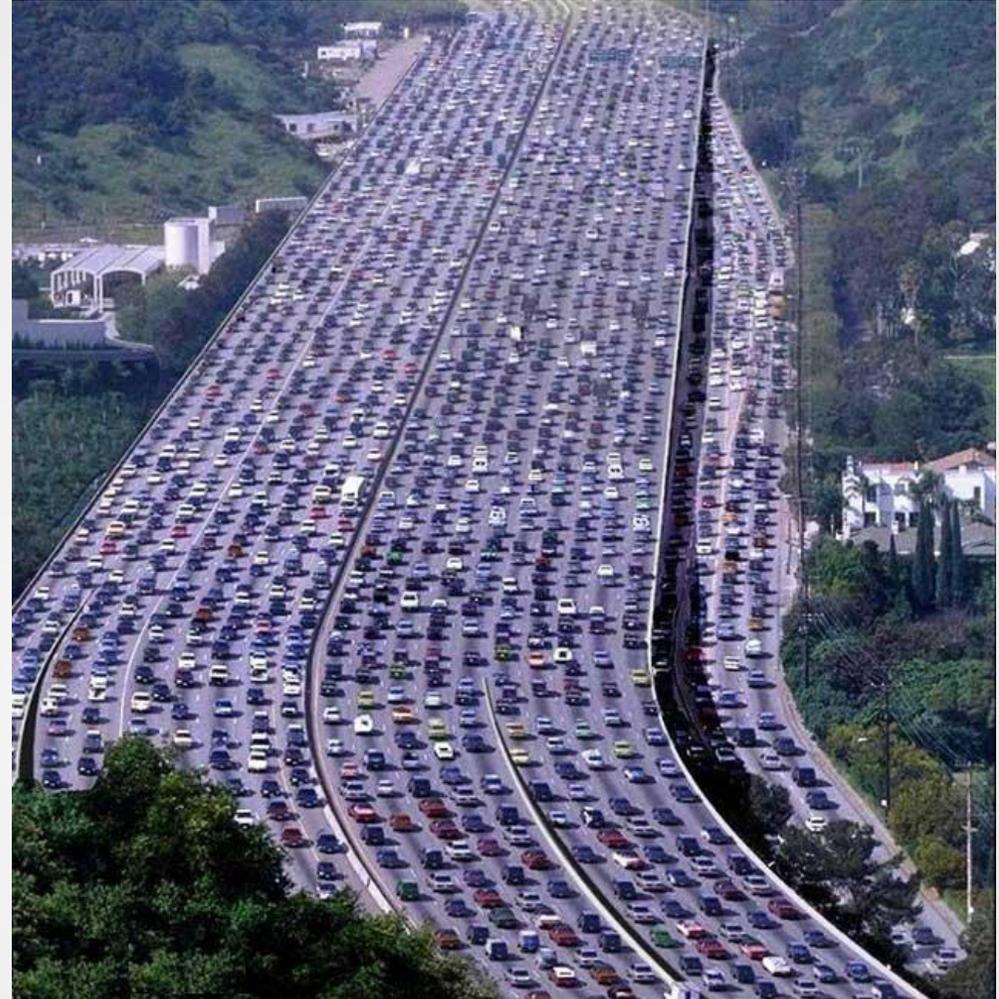
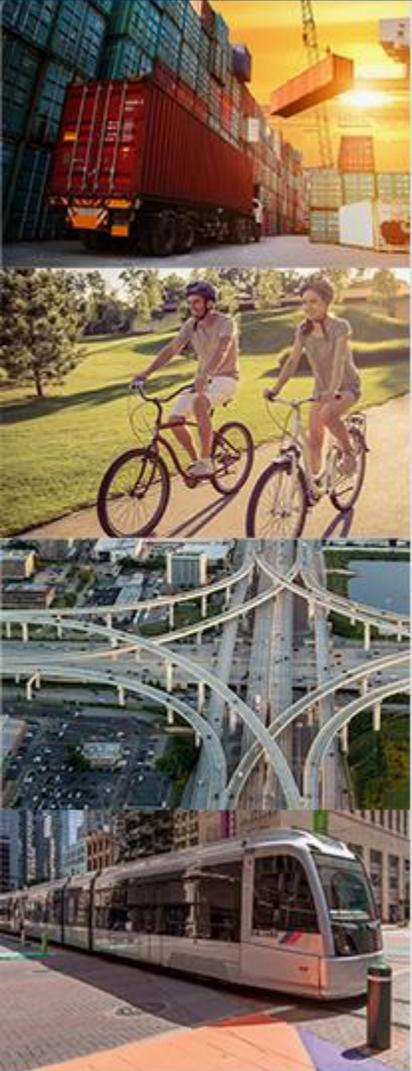
2017



2045

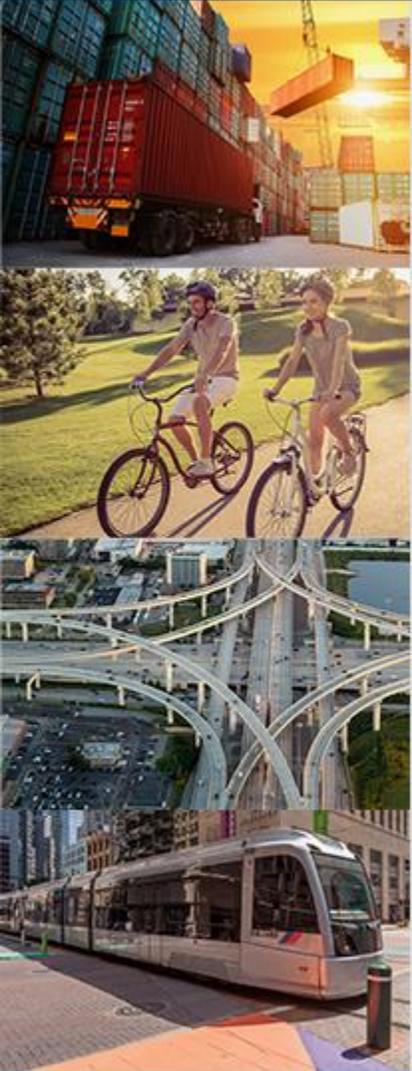
High Capacity Transit Task Force

- 4 million more people and 1 1/2 million more jobs between now and 2045
- Widening highways alone cannot handle growth

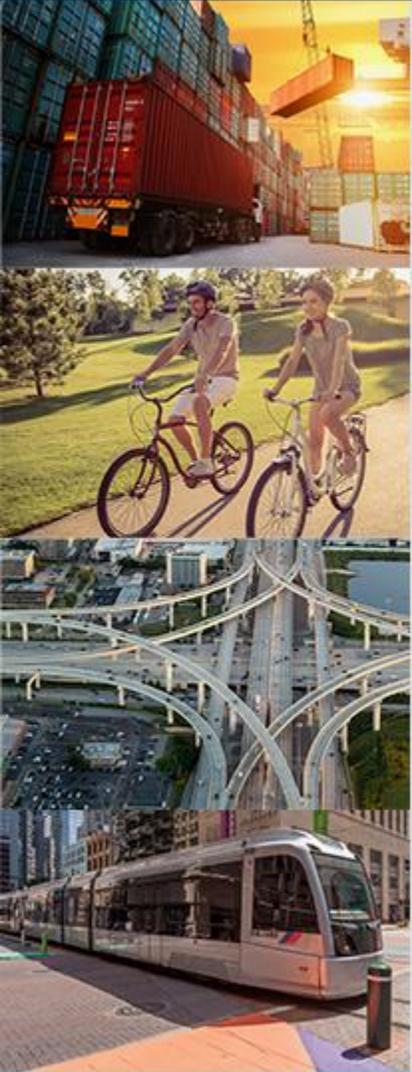


Recap – Last Meeting

- Rail~Volution Panel
 - Moderator: Dan Bartholomay, Rail~Volution (Minneapolis)
 - Rhonda Briggins, Jacobs (Atlanta)
 - Denny Zane, Move LA (Los Angeles)
 - Maria Garcia Berry, CRL Associates (Denver)

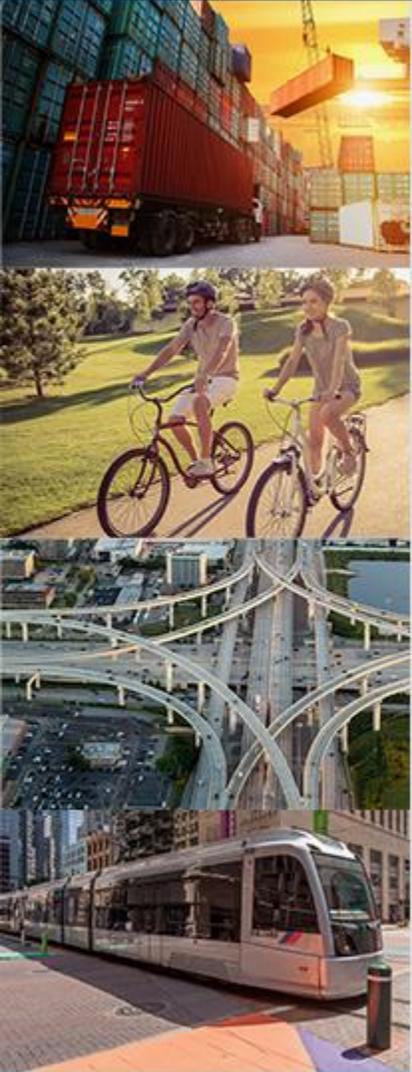


Recap – Last Meeting



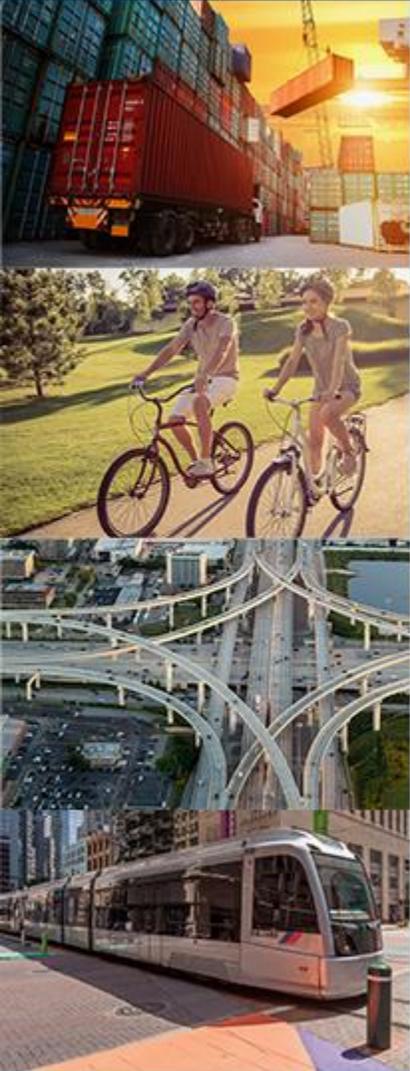
- Focus on building diverse coalitions
 - Inclusive process rather than top-down approach
 - “Everybody needs to play”
- “Fortune favors the bold”
- Use changing attitudes towards transit to your advantage

Service Concepts Workgroup



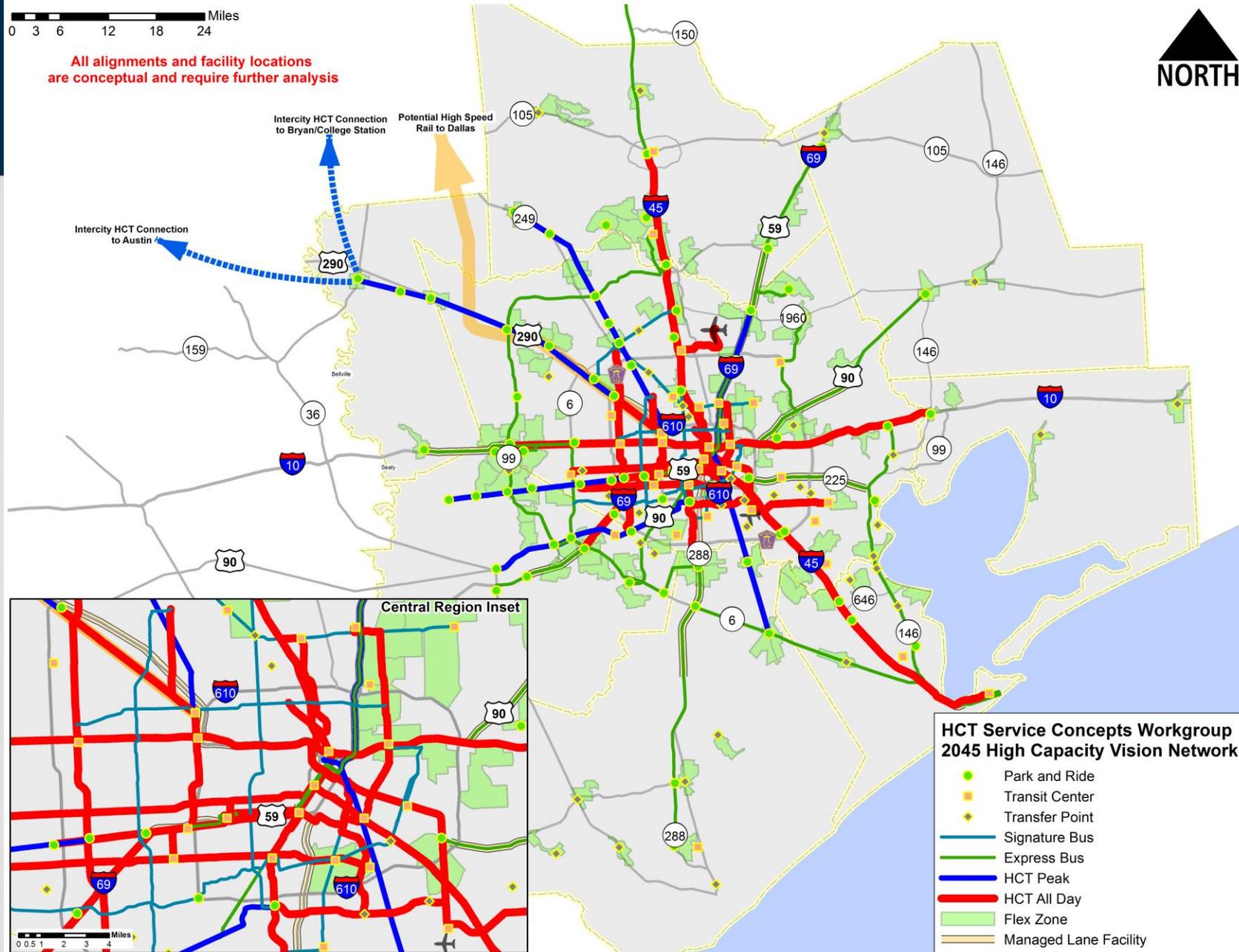
- Workgroup met on December 14
- Reviewed and approved revised HCT Vision Network
- Briefed on Automated Vehicle (AV) applications and proposed University District AV Circulator

Vision



0 3 6 12 18 24 Miles

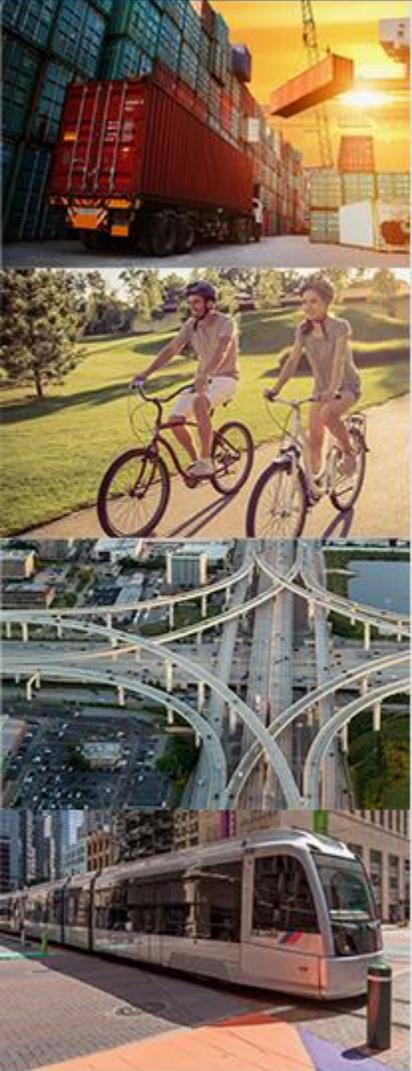
All alignments and facility locations are conceptual and require further analysis



**HCT Service Concepts Workgroup
2045 High Capacity Vision Network**

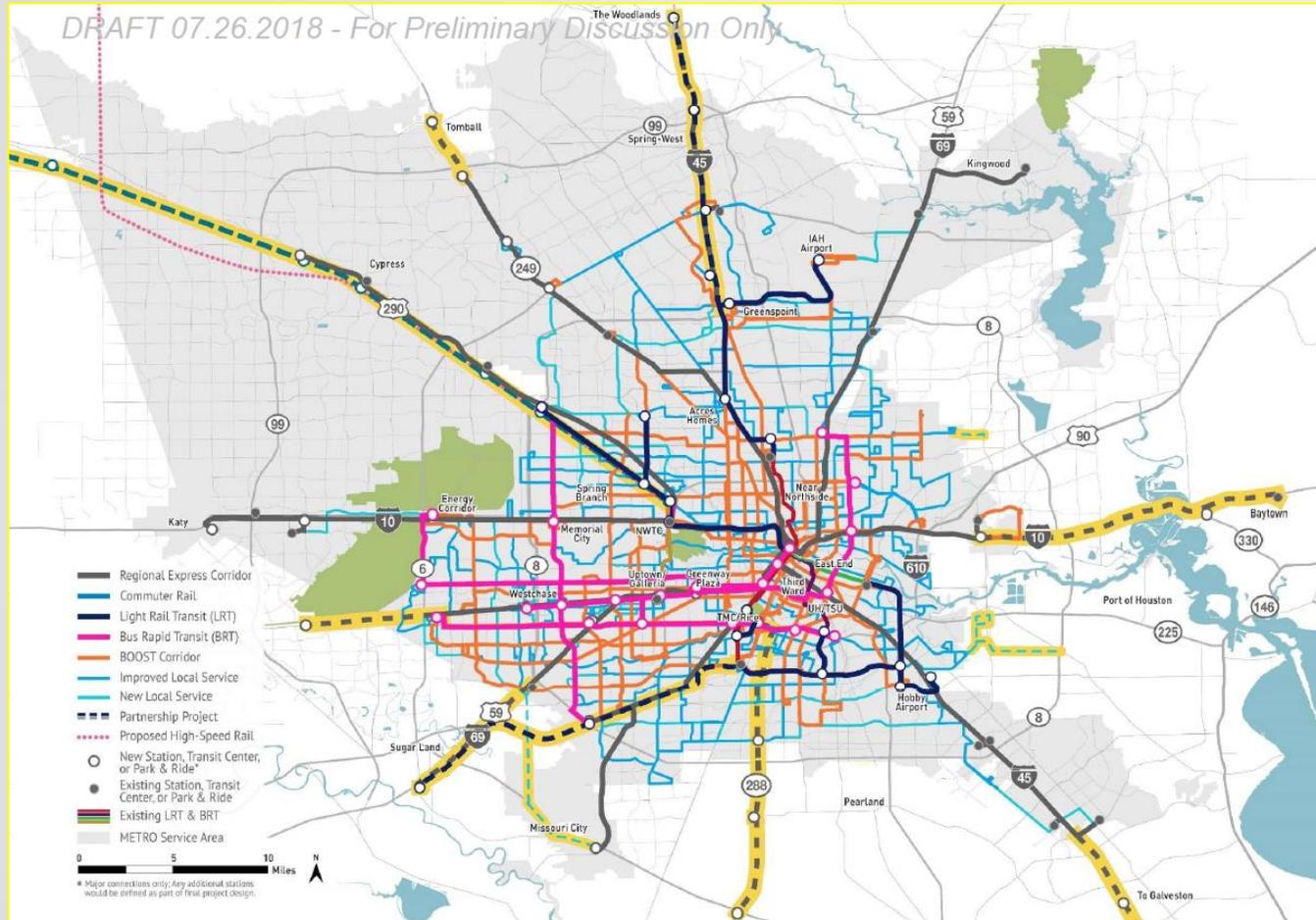
- Park and Ride
- Transit Center
- ◆ Transfer Point
- Signature Bus
- Express Bus
- HCT Peak
- HCT All Day
- Flex Zone
- Managed Lane Facility

Service Concepts Comparison Table



Vision Map	Service Concepts Workgroup	Potential Technologies
Flex Zone	District Circulator First Mile/Last Mile	Deviated Fixed Route; Demand Response
Local and Regional Bus	Local Circulation and Connectivity	Local Fixed-route Bus; Deviated Fixed Route; Bus Rapid Transit (arterial)
Signature Bus		
Express Bus	Regional Commuter/Express	Express/Limited-stop Bus; Bus Rapid Transit; Light Rail DMU, Heavy Rail, Commuter Rail
HCT Peak		
HCT All Day	Sub-Regional Corridor and Internodal Service	Bus Rapid Transit; Light Rail; Heavy Rail; ATS

METRONext Vision Plan

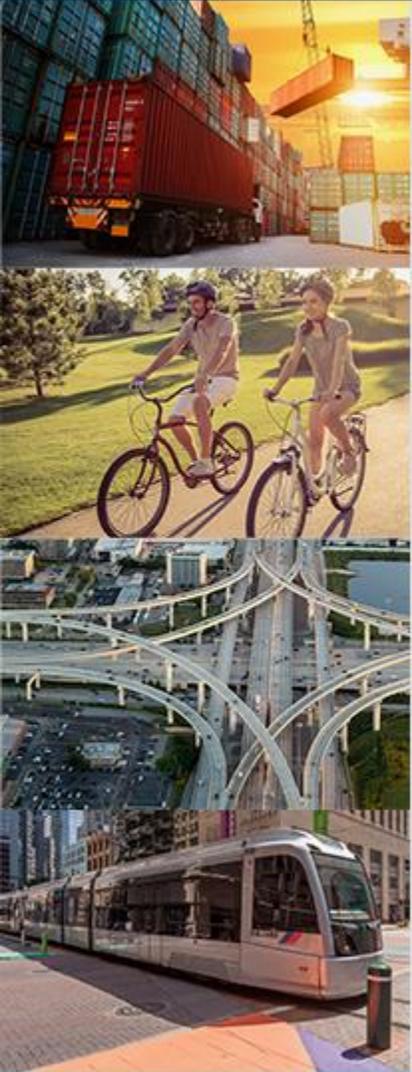


METRONext Vision Plan

Partnership Opportunities

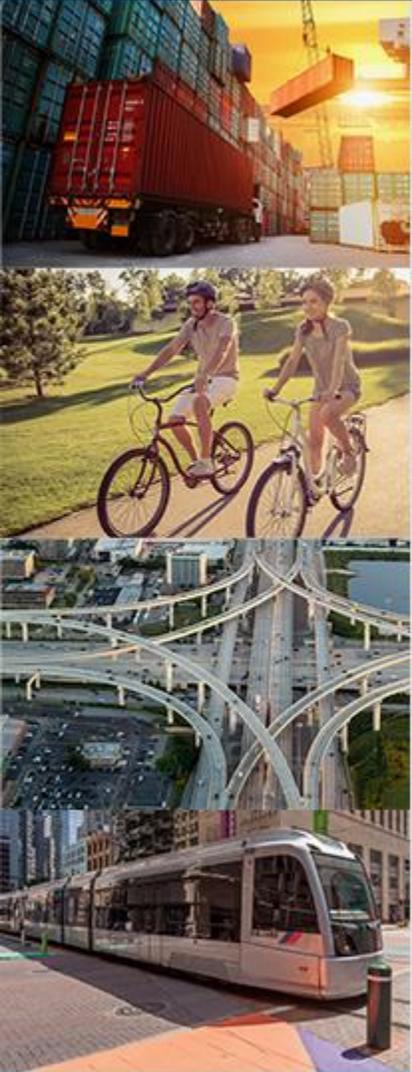
- › Partner projects serving major destinations outside METRO service area
- › Assumes partnership commitment from an outside entity
- › High Capacity Transit Task Force integration ←

Included in Vision Network



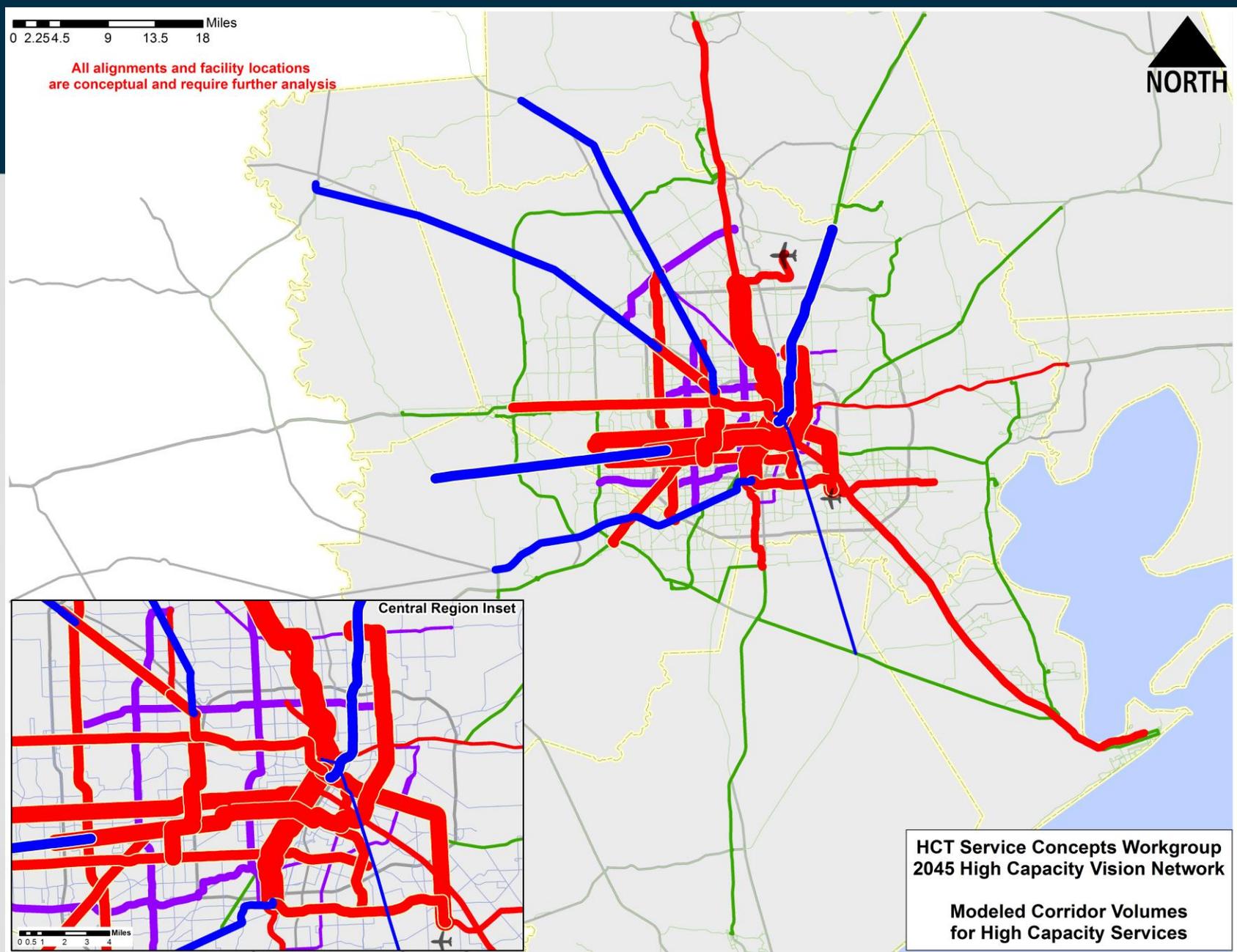
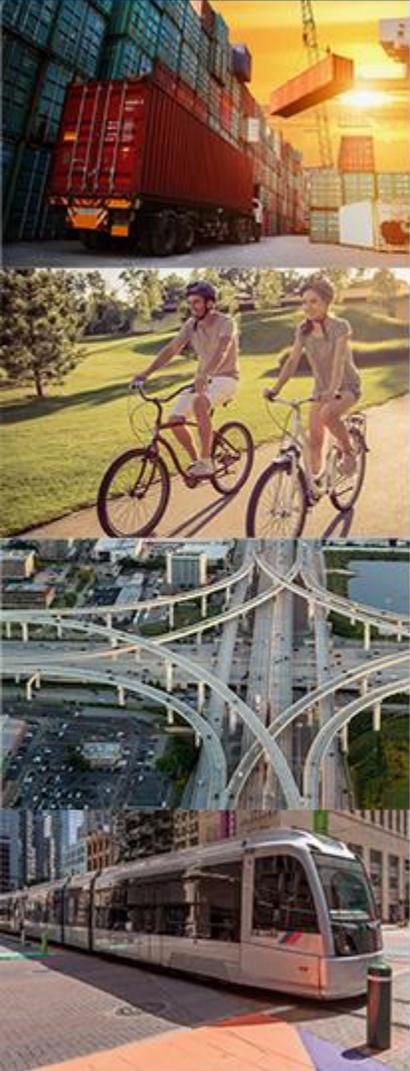
- Expanded local services (areas indicating high transit need that do not currently have service, e.g. Pasadena, Channelview, etc.)
- Regional services (connecting outlying communities to each other and urban core)
- Flex Zones (Community Connectors)
- Suburb-to-Suburb express bus services
- All services feed into HCT network (First Mile/Last Mile)

General Principles/Supporting Concepts

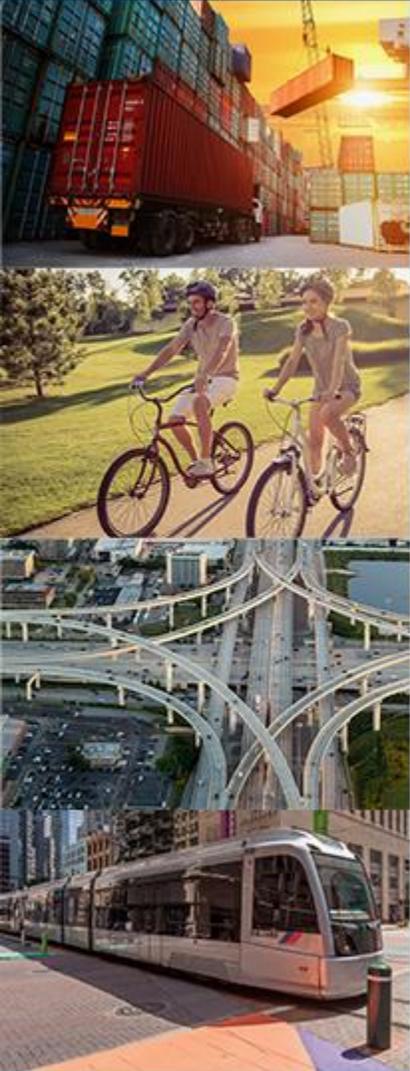


- Policies that should be in place to support/promote HCT in the region
- Some concepts will require cooperation with/assistance from local governments
- Regional HCT requires regional cooperation

Demand



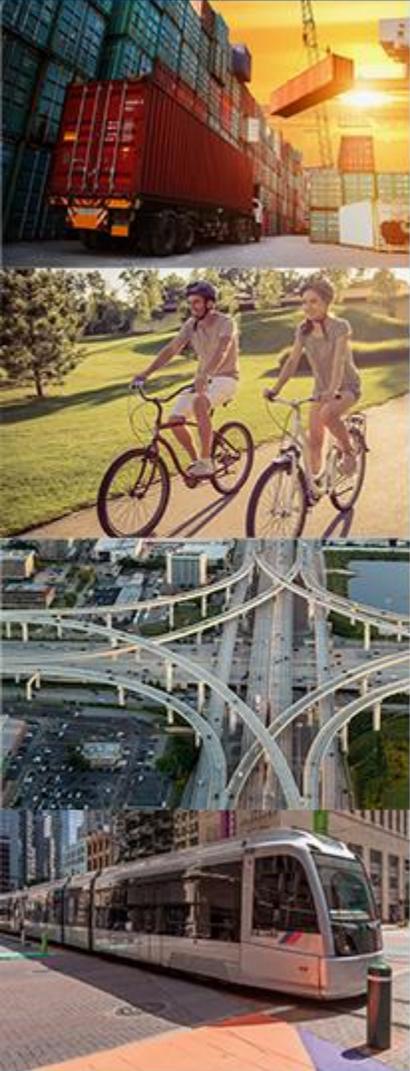
Model Results Comparison Table



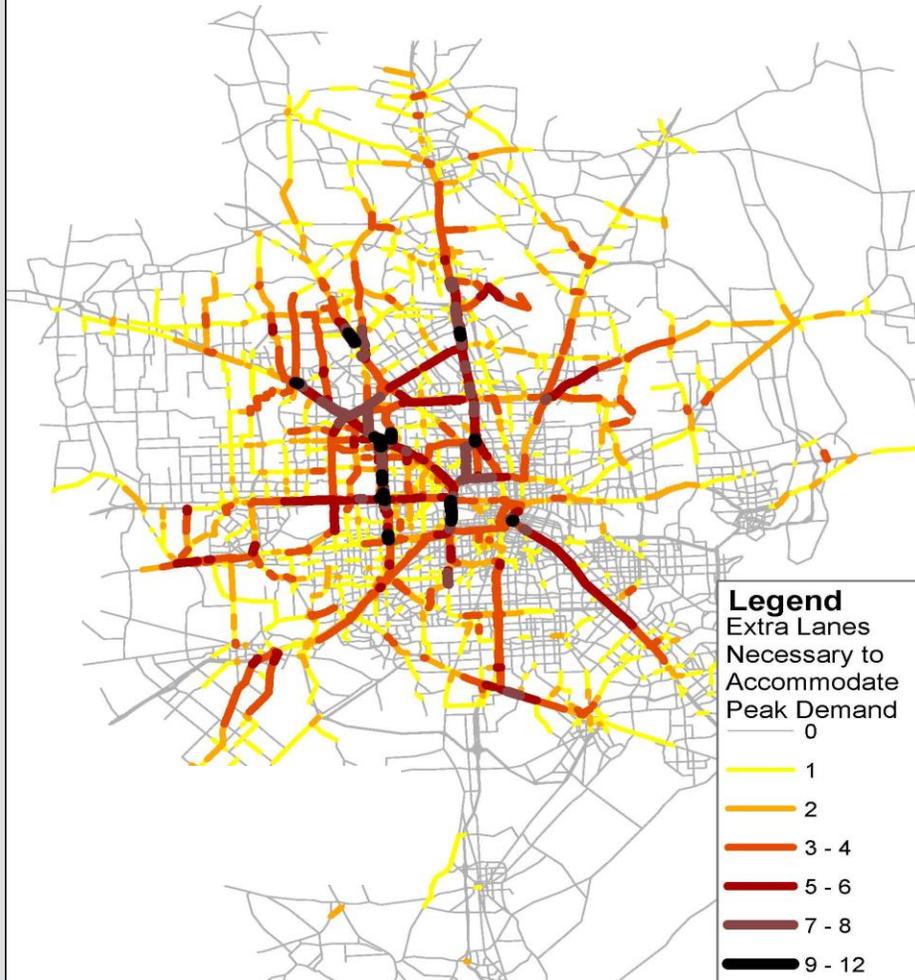
	Current/ Existing*	2040 RTP (2045 forecast)	2045 Vision
Number of Fixed Routes	178	194	275
Miles of HCT Guideway	27.6	128.3	523.2
Annual Transit Demand (Fixed Route Boardings)	86,269,600	388,882,500	763,943,533
Share Carried by HCT	21.2%	48.4%	69.2%
Annual Passenger Miles (Fixed Route)	513,316,860	2,107,116,000	4,348,471,793
Regional Roadway VMT (24-hour)	189,317,729	304,794,877	290,874,650
Regional Roadway VHT (24-hour)	6,350,332	12,208,125	7,650,300
Transit Mode Share (HBW)	2.3%	6.5% Portland	20.2% 2 nd only to NYC
Transit Mode Share (HBNW)	n/a	0.8%	1.8%

*2017 National Transit Database, 2016 US Census ACS, METRO FY 2018 Budget

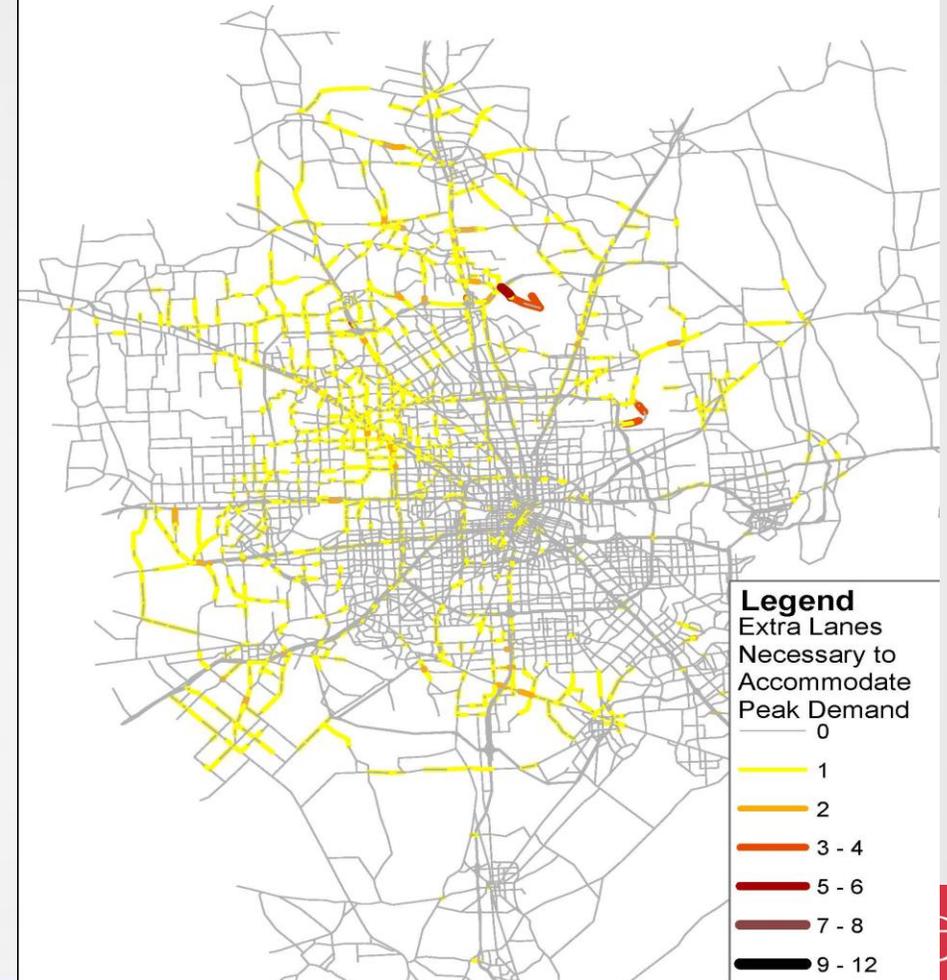
Impact of HCT "Vision" Plan



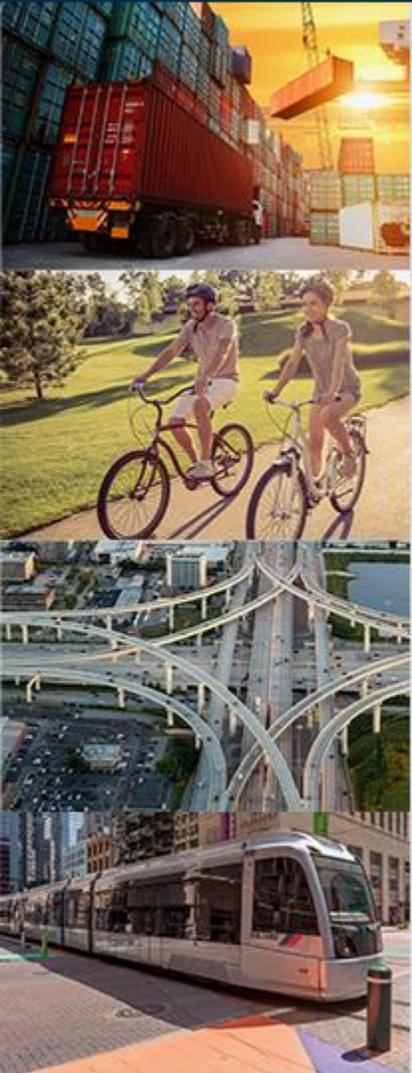
Additional Lane Miles Needed w/o Vision



Additional Lane Miles Needed with Vision

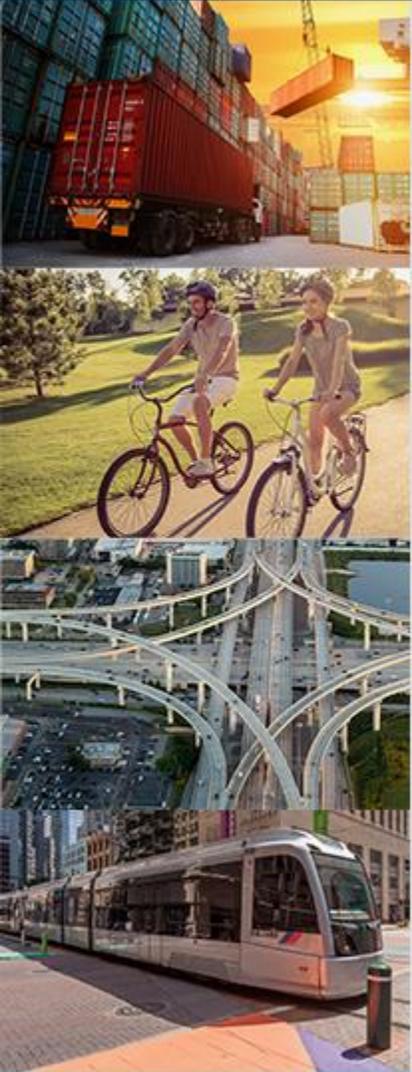


“HCT Vision” Impact on Travel Demand



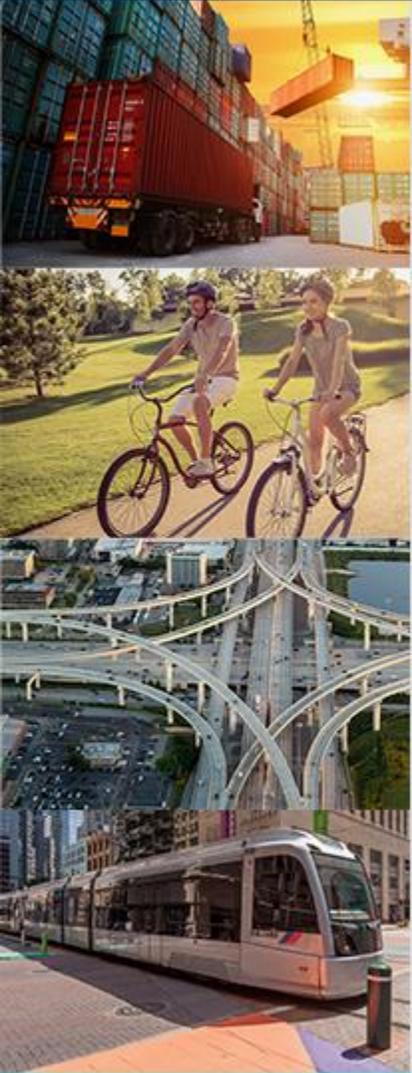
Functional Class	Proposed Additional Roadway Lanes: 2017-2040 RTP	<u>Additional Lane Miles Needed Based with No Additional Transit</u>	Additional Lane Miles Needed Based on HCT “Vision”
Arterials	1,177	2,309	438
Collectors	287	1,064	340
Freeway/Tollway	1,203	1,396	152
Frontage Roads	320	776	68
Managed Lanes	118	205	3
Ramps	195	196	38
Grand Total	3,300	5,947	1,040

Evaluation Criteria



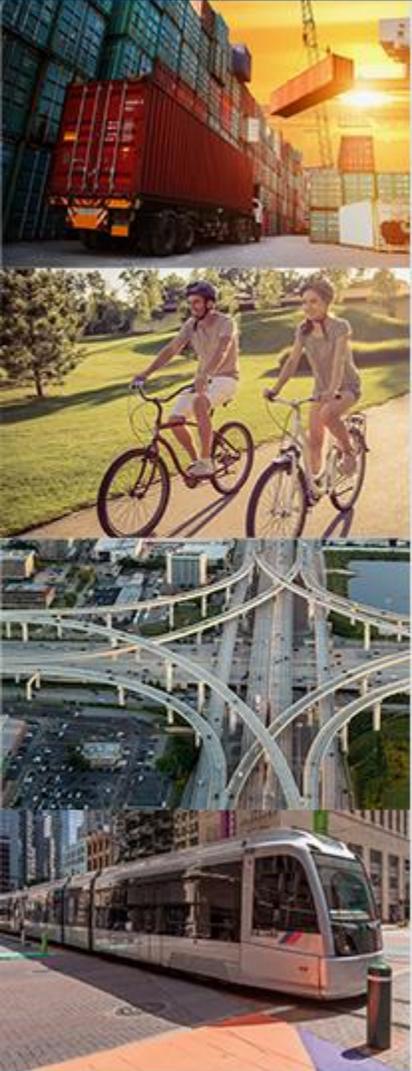
- Does the proposed option improve access and mobility from communities to and from major activity centers such as:
 - Workplaces/Employment Centers?
 - Health and Education Centers?
 - Economic Centers?
 - High Capacity Transit Hubs?
- Does the proposed option present the best travel alternatives to heavily congested freeways and roadways?

Evaluation Criteria



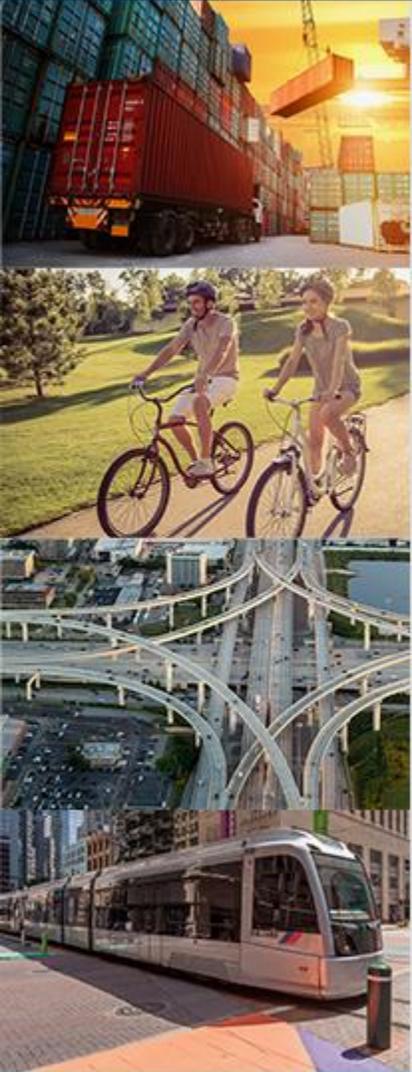
- Does the proposed option contribute to the economic development of the region or its standing as an international City/Hub?
- Does the proposed option enhance the full spectrum of livability (live, work, play; see H-GAC Livable Centers studies) for people of all incomes, abilities, and ages?

Evaluation Criteria



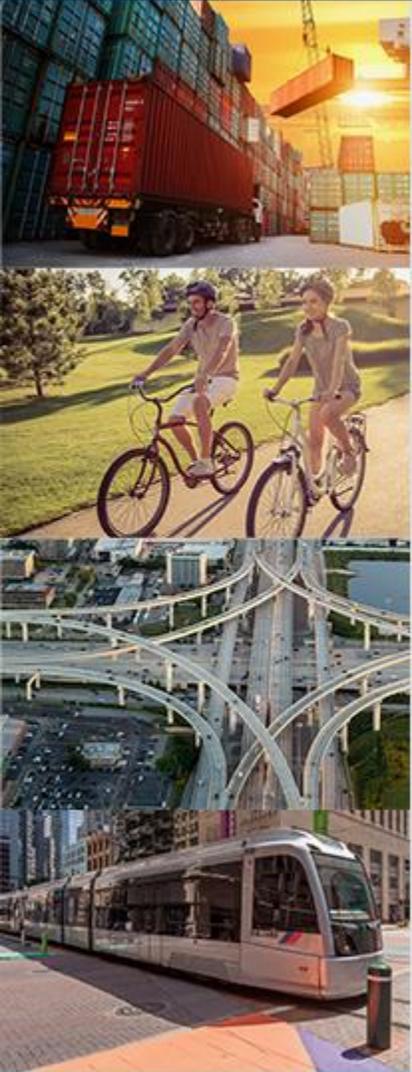
- Does the proposed option allow sufficient flexibility to change service patterns as warranted by evolving demand?
- Does the proposed option provide connectivity for an integrated multimodal HCT system with system-wide, cohesive connections from start-to-finish (for the maximum span of service hours possible)?

Evaluation Criteria



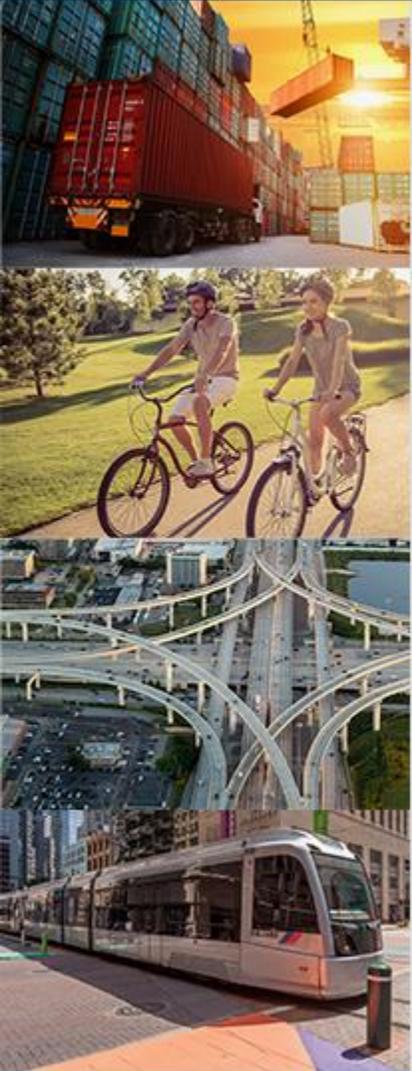
- Does the proposed option make the transit system more resilient in the event of extreme demand or catastrophe?
- Does the proposed option allow transit users and non-users to travel safely?
- Does the proposed option contribute to emissions reductions?

Capital Costs



- We generated a range of scenarios, from “low” (everything BRT at-grade) to “high” (everything LRT grade-separated)
- Same unit costs as used for METRONext
- Higher level of investment: faster speeds; more capacity, reliability, safety
- Passenger facility, O&M facility, and fleet costs (non-HCT) the same across all scenarios
- All scenarios include allowances for SOGR and Universal Accessibility

Capital Cost Scenarios

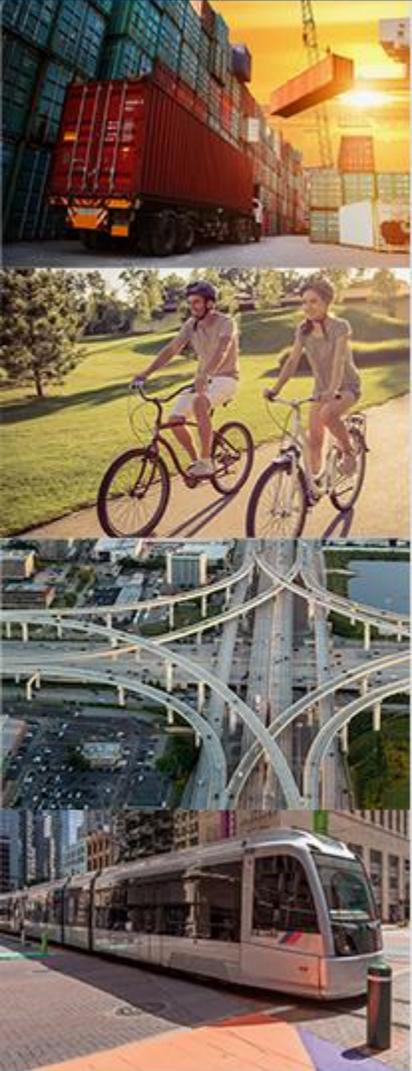


- **Low:** \$34.4 B
- **Medium Low*:** \$42.9 B
- **Medium High:** \$81.0 B
- **High:** \$100.1 B

* Closest to draft METRONext Vision Plan

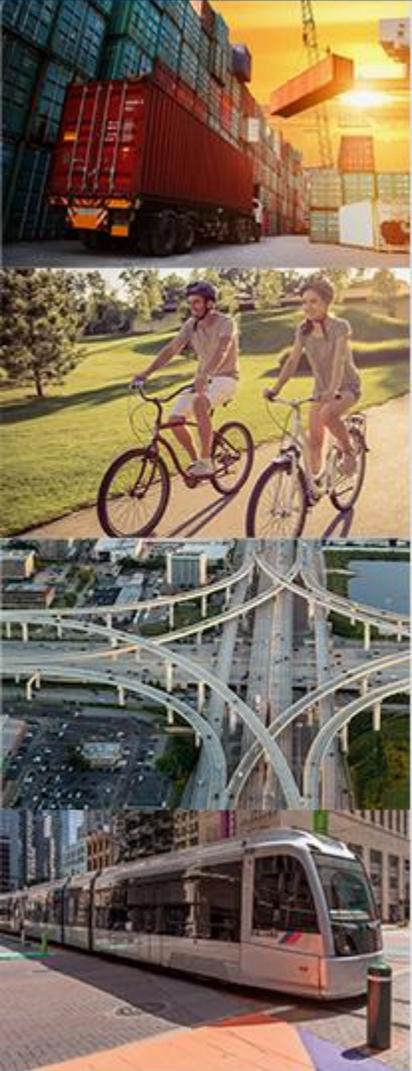
Operating and Maintenance Costs

- O&M costs based on regional NTD data
- Does not take into account potential future labor savings from automation
- O&M costs gradually increase from today's service baseline to full buildout of Vision network in 2045
- **ESTIMATED AT \$30.7 BILLION**
(2018 dollars, cumulative over 27 years)

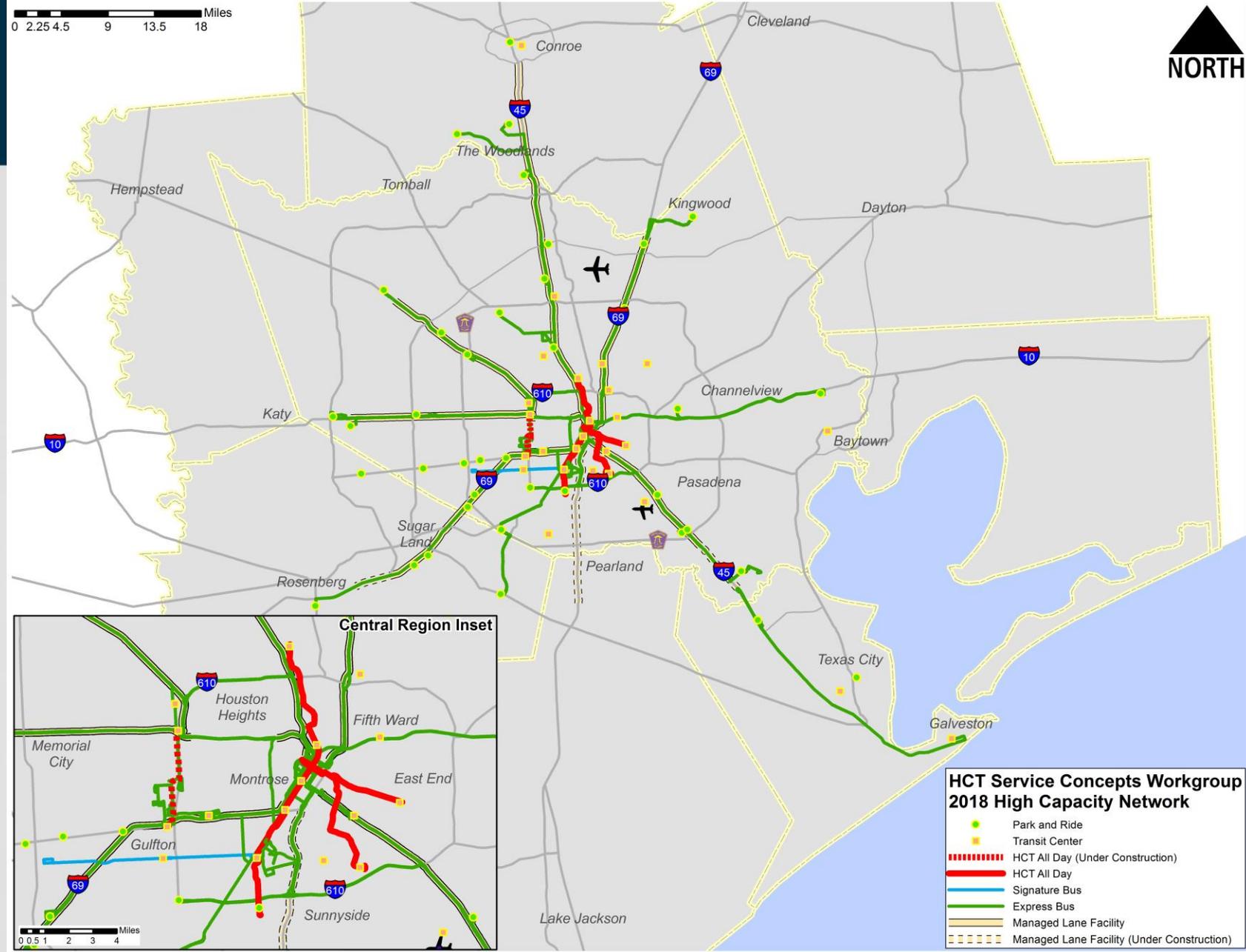


Regional HCT Priorities

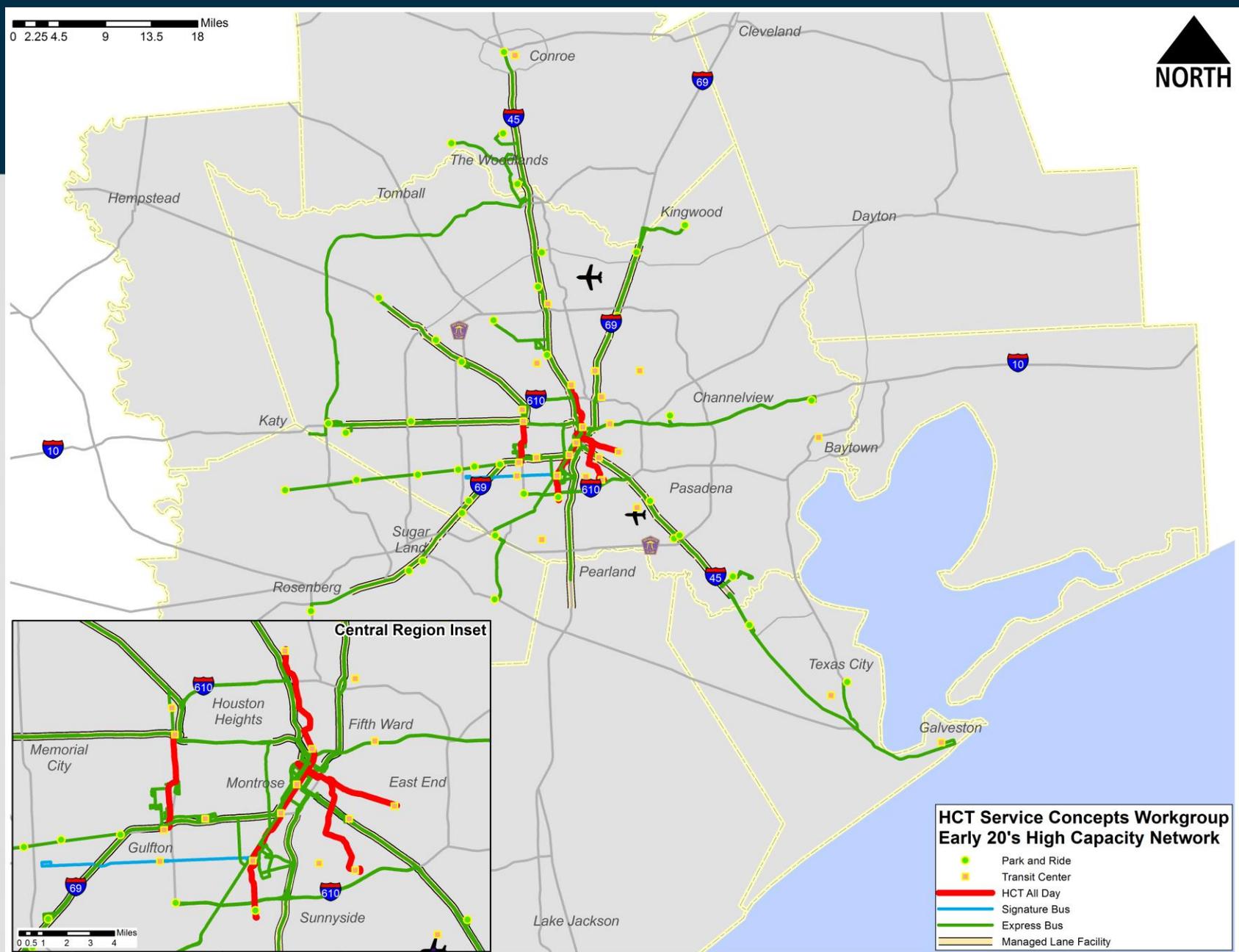
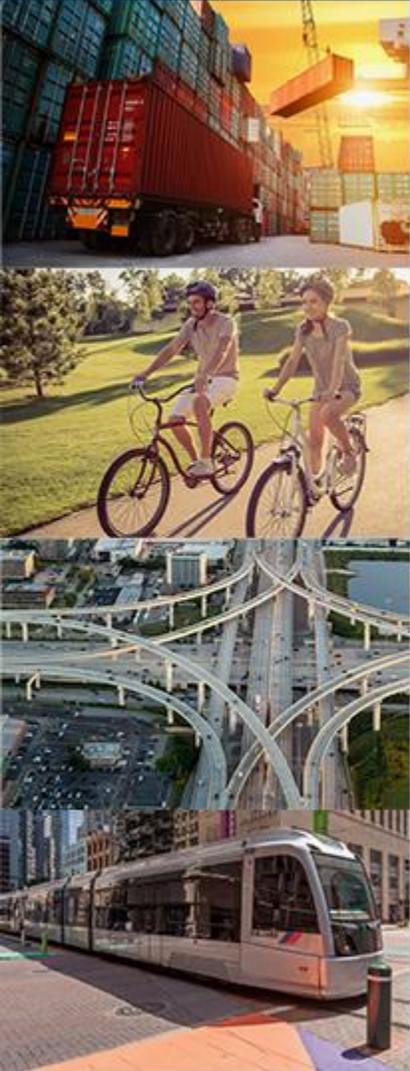
- Closure of the Inner Katy “Gap”
- Extensions to intermodal connections: Hobby and Bush IAH Airports, Texas Central HSR
- University Line (Westpark/Richmond/Lockwood)
- Westheimer and Gessner
- Conversion of HOV facilities to two way/all day
- Connectivity beyond METRO Service Area, e.g. Fort Bend County, Waller County, eastern Harris County, Liberty County



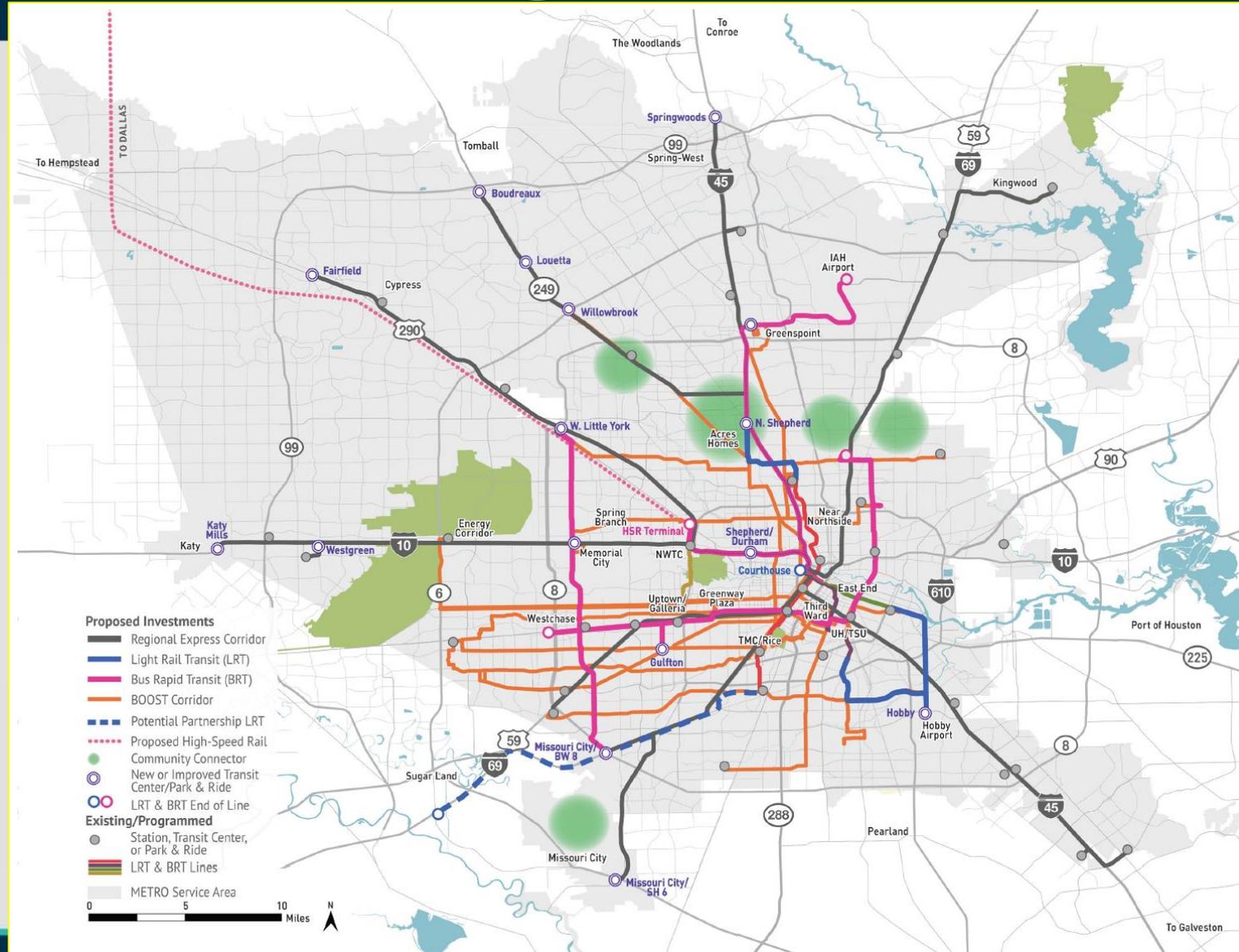
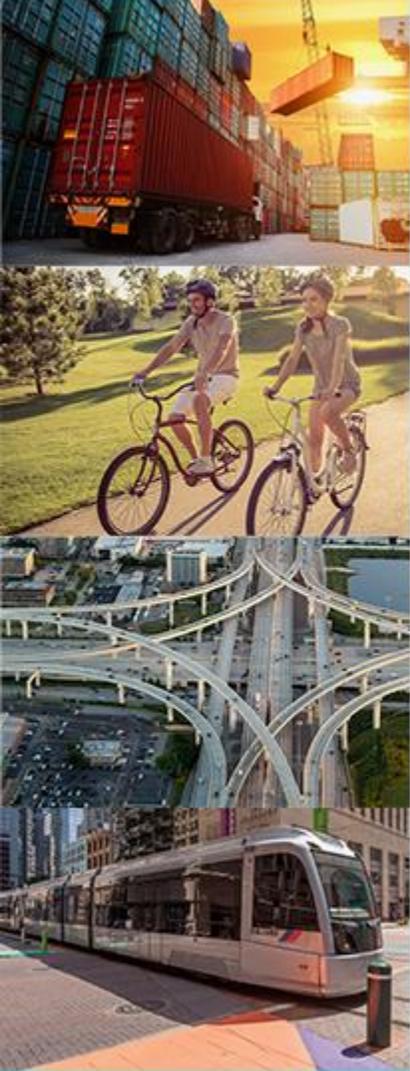
Today



On Deck



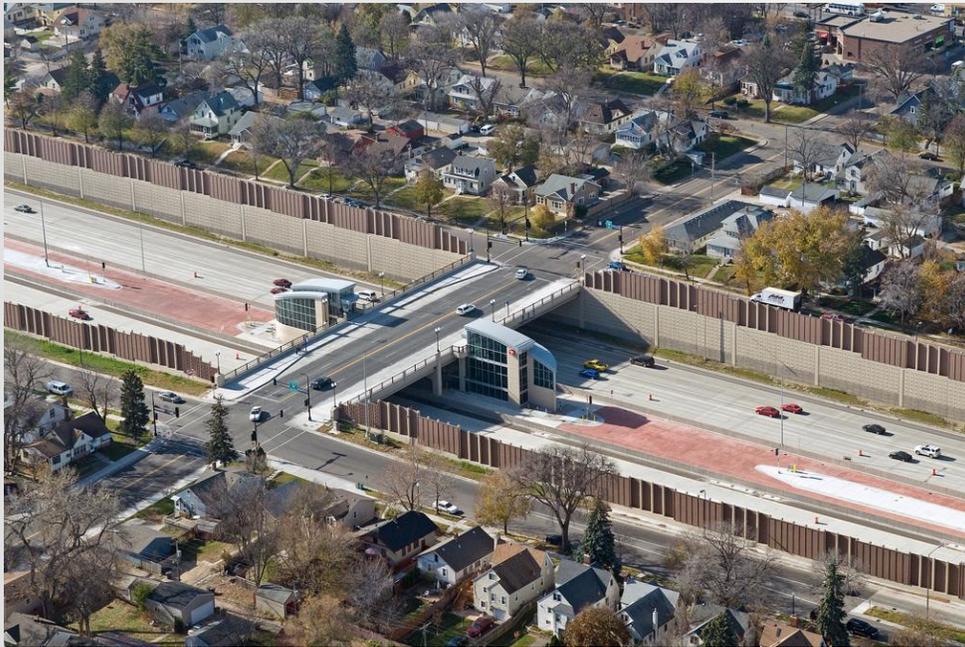
METRONext Moving Forward Plan A+



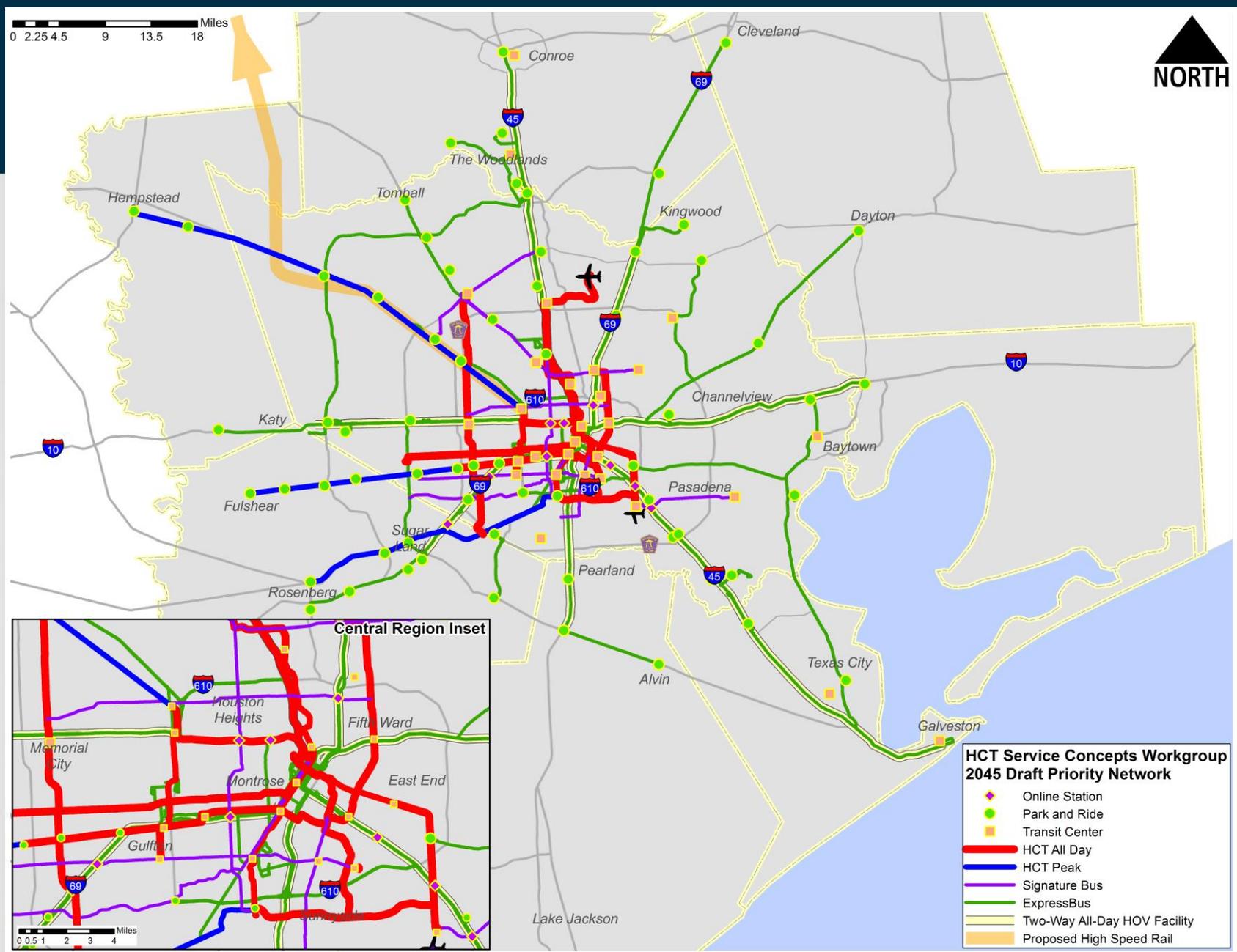
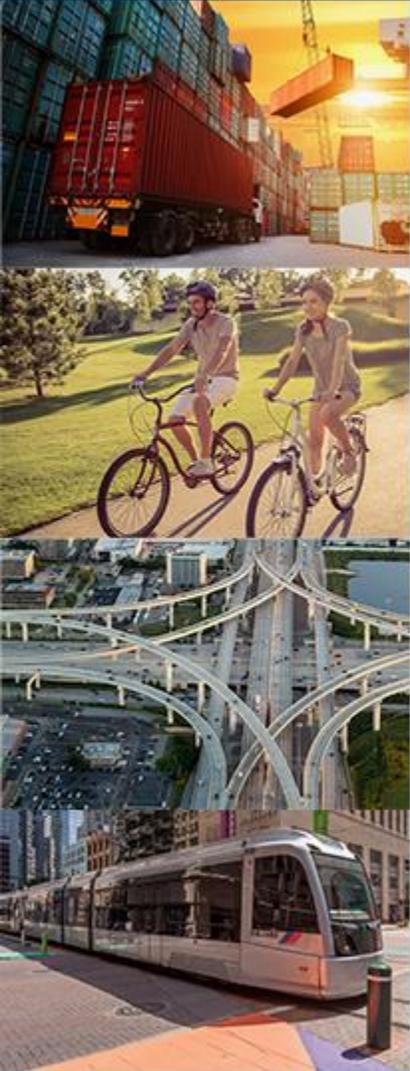
Regional Collaboration • Transportation Planning • Multimodal Mobility

Better Connectivity to HOV Network

“Online” Bus Stations



Priority



High Capacity Transit for the Houston Region – Creating a Multimodal System Approach for the 21st Century

AN OPINION PAPER BY J. SAM LOTT
TSU'S CENTER FOR TRANSPORTATION TRAINING AND RESEARCH

JANUARY 25, 2019

HIGH CAPACITY TRANSIT TASK FORCE MEETING

AV Transit Mobility Benefits

Automation of transit systems will allow routing and services to be dynamically adjusted to meet ridership demand patterns

- ❑ Integration of AV Microtransit and AV Bus Systems
- ❑ Combinations of Routes and Networks
- ❑ Provide customized service for many passengers
- ❑ Vehicle-miles tied more directly to passenger miles

Small 4 Passenger Microtransit Vehicles – Seated Passengers Only



Source: Aurrigo, div. of RDM Group <https://aurrigo.com/>



Source: 2getthere www.2getthere.eu

Medium 10 Passenger Microtransit Vehicles – Seated and Standing Passengers



Source: Naveya <https://naveya.tech/en/>



Source: Local Motors (Olli) <https://localmotors.com/>

Large 20 Passenger Microtransit Vehicles – Seated and Standing Passengers



Source: 2getthere www.2getthere.eu



Source: 2getthere www.2getthere.eu

20 Years of AV Bus Research Has Produced Near Term Prospects for AV Bus Systems Combining Automated Driving Systems and Platooning Technology

Japanese R&D



Toyota ITMS Automated Buses at 2005 Aichi Expo

United States R&D



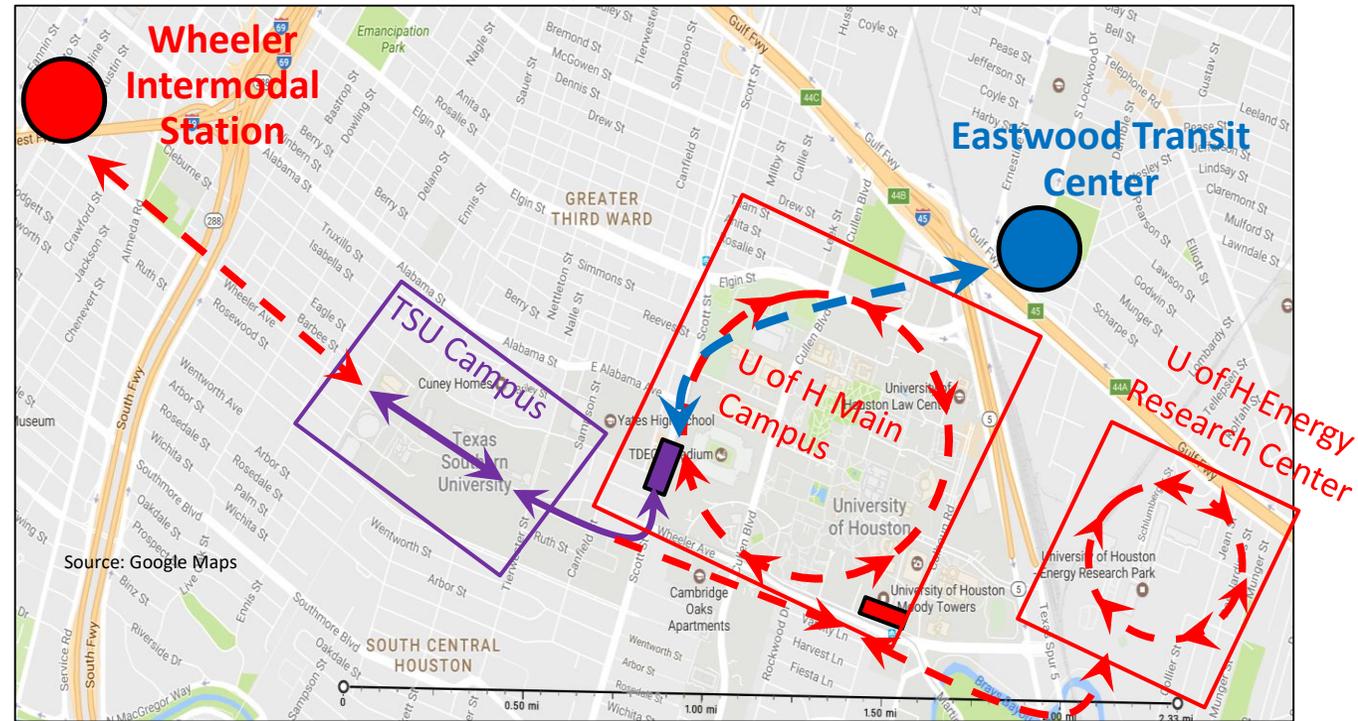
Houston METRO Buses in 1997 FHWA Automated Highway System Demonstration Project

Houston's University District AV Transport System – Ridership, Alignment and Operational Analyses

Conceptual Definition and Operational Plan of Full Buildout System

Regional MPO's Unified Planning Work Program (UPWP) is beginning a process to study progressive first-mile/last-mile connections using AV Transit Technology to reach:

- Purple Line LRT
- Eastwood Transit Center
- Red Line LRT at Wheeler Intermodal Station



TSU Early Deployment Ph. 1 and 2	↔
Medium Term Depl. Eastwood Transit Center	↔
Long Term Depl. U of H Main Campus and ERC	↔

Proposed HCT Regional Plan – Earliest Level 4 Deployments in Full Size AV Buses Operating in Dedicated HOV Lanes

Source: Google Earth

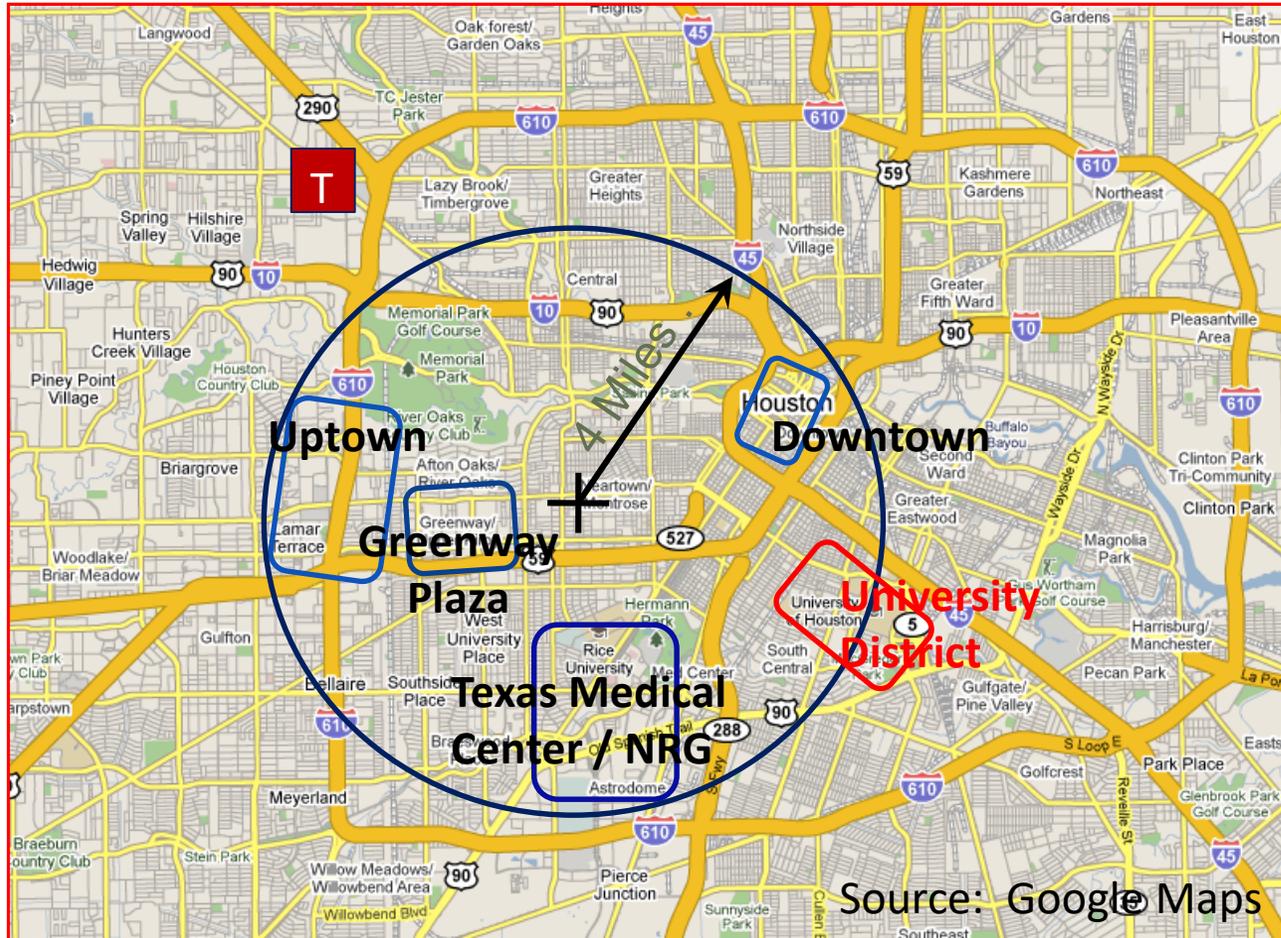


Source: Houston METRO



SAE Level 4 automation can transition to Level 3 when trained operators take control when the vehicle leaves the controlled environment of the dedicated HOV/Managed Lane facility.

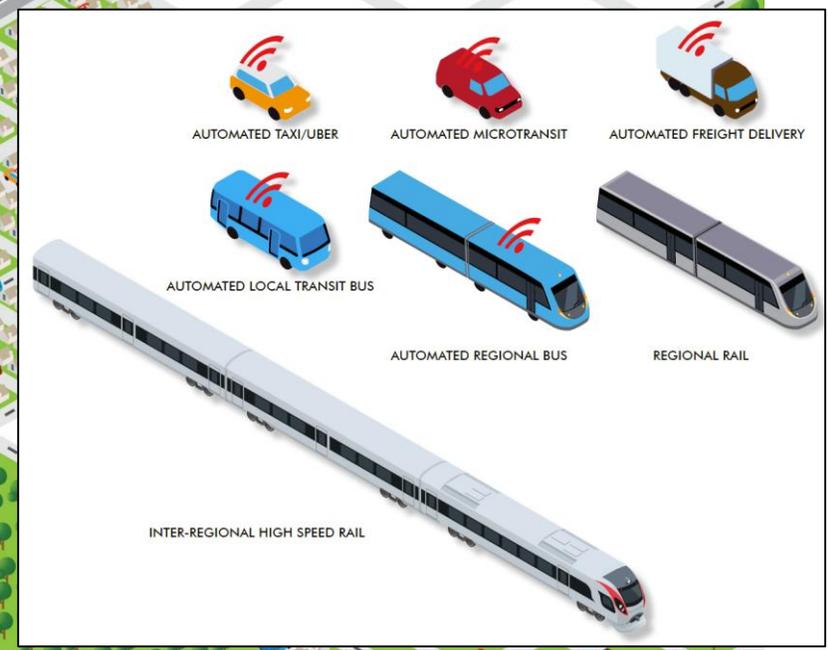
Proposed Regional Plan: Create AV Circulation Systems in All Major Districts Within Houston's Urban Core and Around the Region



T HSR Passenger Terminal and Intermodal Hub

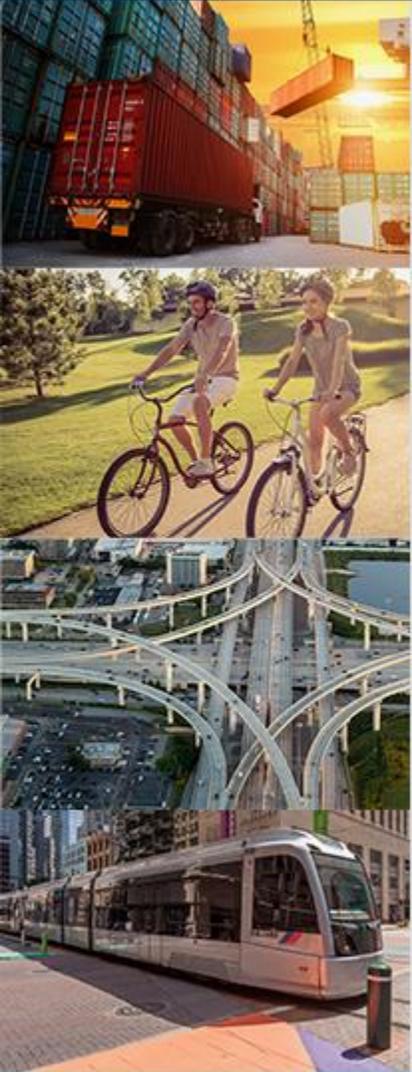
Four Urban Employment Districts Other than the University District are large enough to be in the list of the top 15 CBDs in the country.

Source: Google Maps



High Capacity Transit for the Houston Region – Creating a Multimodal System Approach for the 21st Century

Innovative Finance Workgroup



- Workgroup met on January 23rd
(Jointly with Economic Development)
- Reviewed Vision Network, Costs
- Reviewed Revenue Strategies
- Reviewed Benefit/Cost Analysis
 - More analysis is required

Estimated Revenues (if nothing changes)

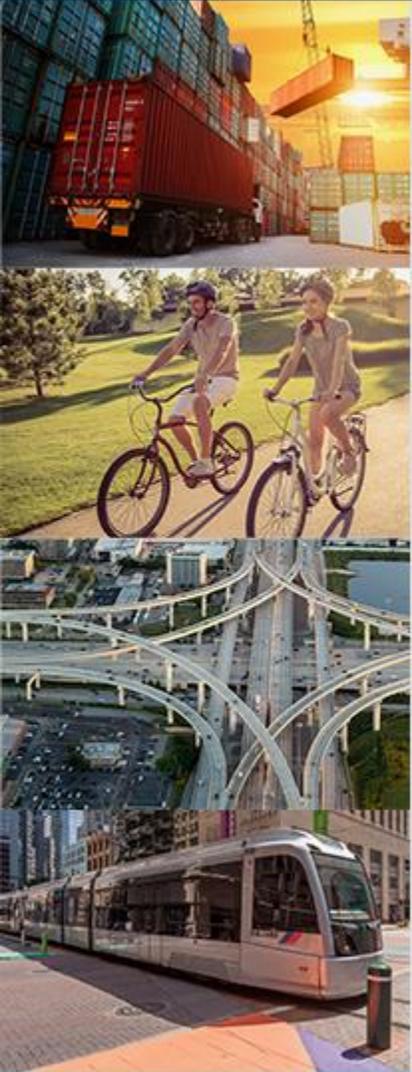


■ METRO Farebox:	\$ 2.2 B
■ METRO Sales Tax (less GMP):	\$ 18.2 B
■ Federal Formula:	\$ 3.3 B
■ Federal Discretionary:	\$ 1.4 B
■ Non-METRO Farebox:	\$.2 B
■ Non-METRO Local:	\$.3 B

ESTIMATED REVENUES **\$ 25.6 B**

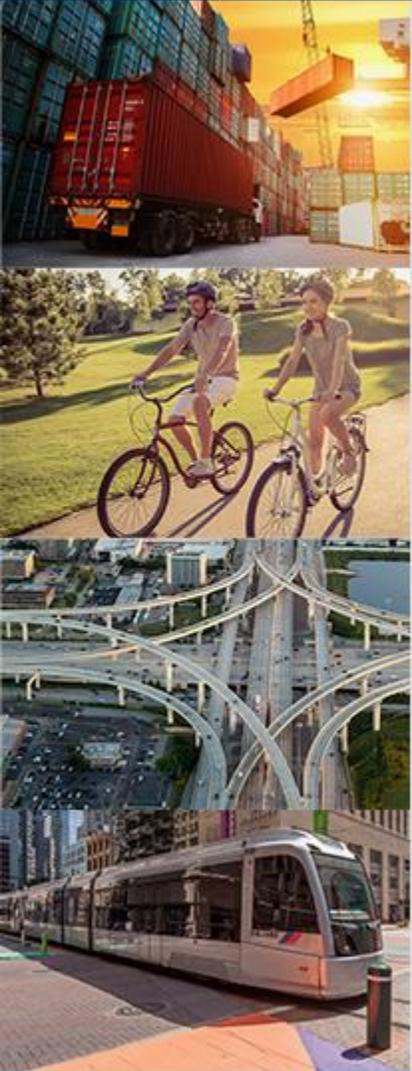
(Based on 2040 RTP revenue model and current NTD data, extrapolated to 2045 using current dollars)

Key Realities



- Any significant expansion of HCT in the region will require revenue sources that do not currently exist
- Funding for HCT is going to require difficult political decisions at the local and state level
- Private sector participation will likely be critical

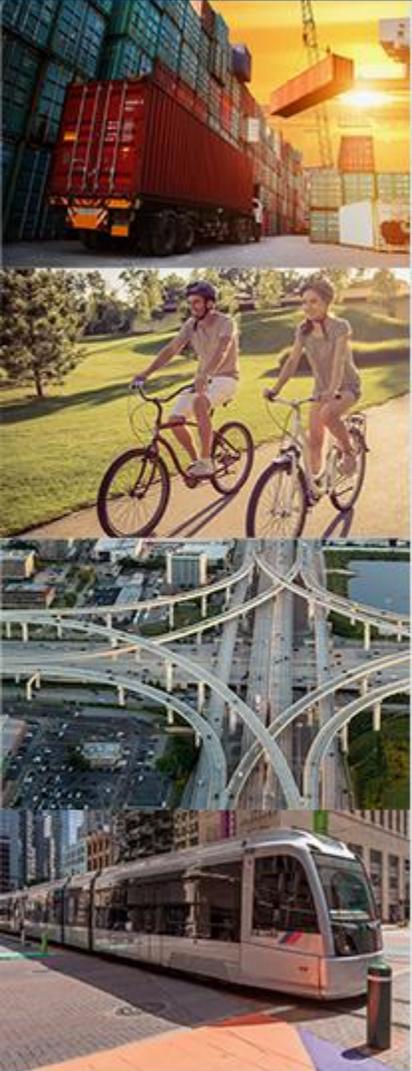
Potential Base Strategies



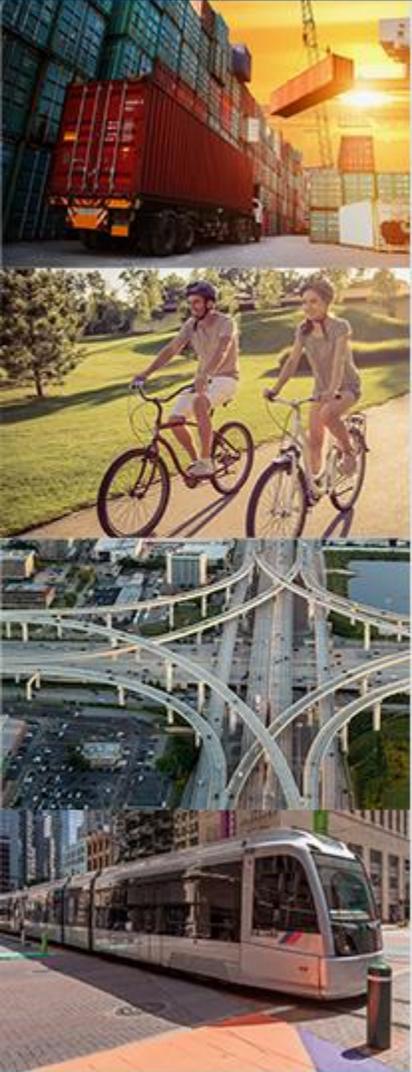
- **Public-Private Partnerships**
 - FTA new guidance re: Private Investment Project Procedures (PIPP) - intended to “address impediments to the greater use of public-private partnerships and private investment in public transportation capital projects.”
 - Not all transit projects will be eligible or appropriate for PPPs
- **Federal Loans (TIFIA, RRIF)**

Potential Base Strategies

- Value Capture Strategies
 - Impact Fees
 - Special Assessment Districts (SAD)
 - Tax increment financing (TIF)
 - Parking and Station Revenues
 - Naming Rights
 - Joint Development/TOD



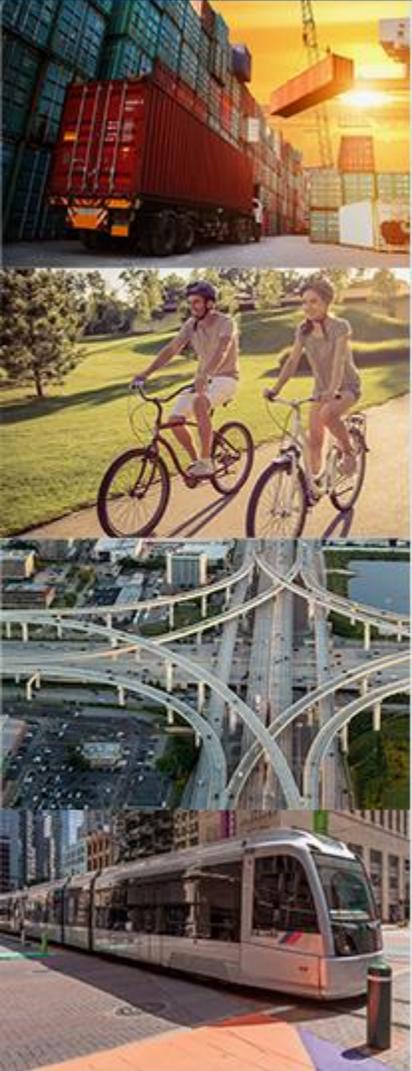
Potential Local Strategies



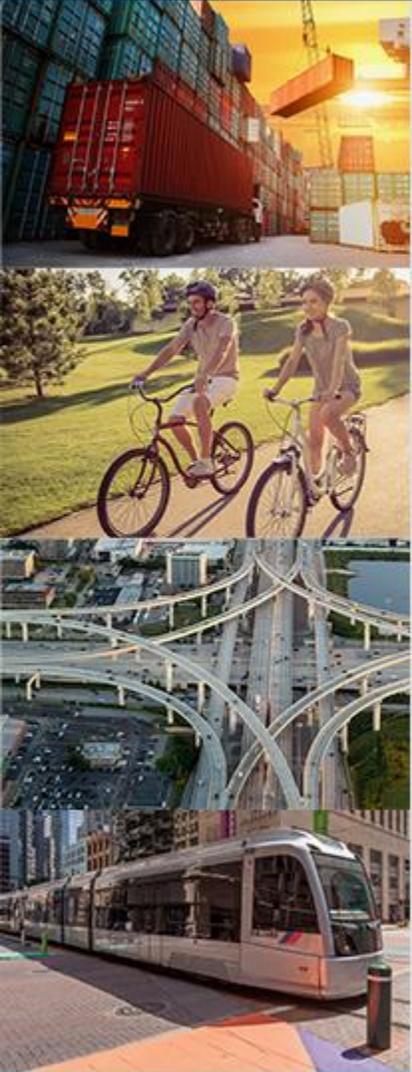
- Allow transit projects to compete for highway funding based on performance criteria established by TPC
- Increase municipal and county funding support for transit outside METRO service area
 - Almost every regional municipality has reached 8.25% local sales tax cap

Strategies Requiring Legislative Action

- Increase transit projects' eligibility for state funding
- Implement local/regional option tax
- Raise 8.25% local sales tax cap

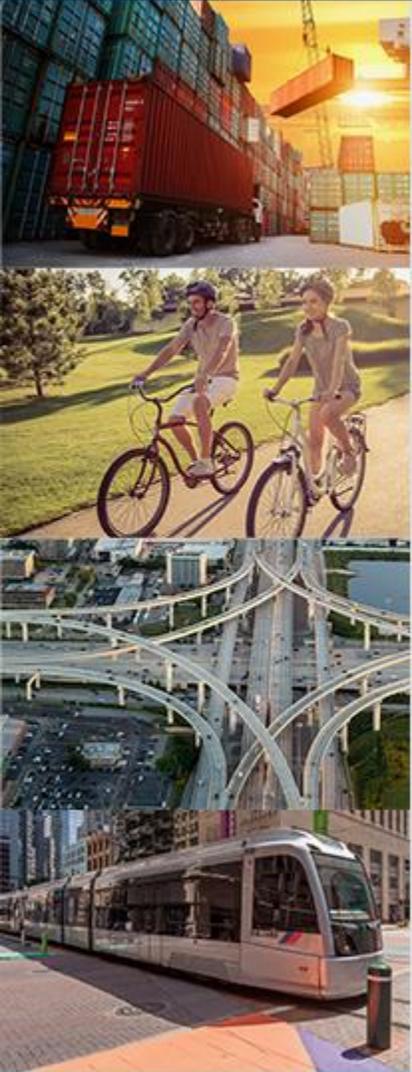


The Region Must Speak with One Voice



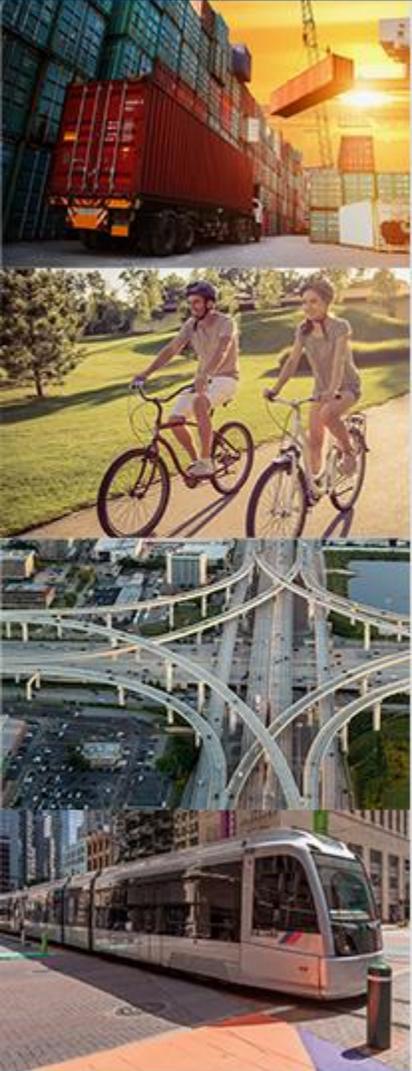
Regional Collaboration • Transportation Planning • Multimodal Mobility

Economic Development Workgroup



- Workgroup met on January 23rd
(Jointly with Innovative Finance)
- Reviewed Vision Network, Costs
- Reviewed Revenue Strategies
- Reviewed Benefit/Cost Analysis
 - More analysis is required

Benefit/Cost Analysis



REMI TranSight Inputs for Transportation Projects

From Project Specific Data

- Construction Costs
- Operation & Maintenance
- Finance Options
- Regional Effects

From Travel Model

- VMT
- VHT
- VTT

Fuel Demand
Emissions
Safety
Time Savings

TranSight

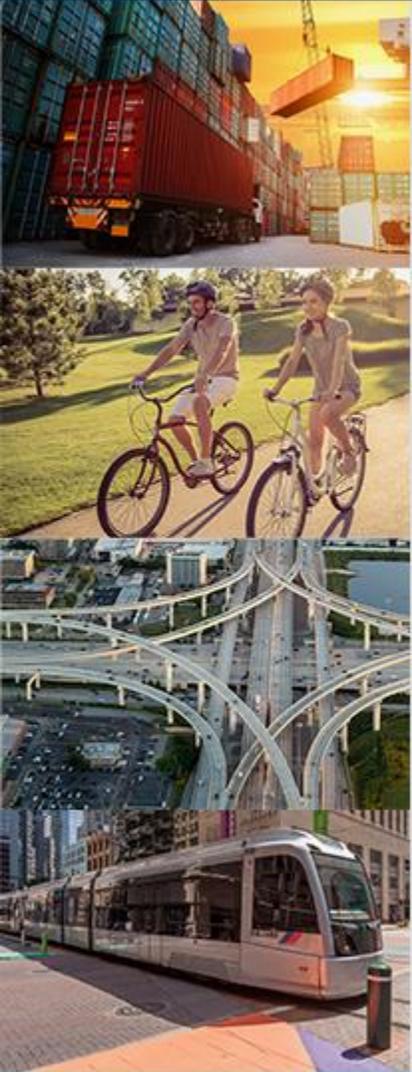
Economic Results

Run Economic Model

REMI Policy Variables

Transportation
Cost Matrices

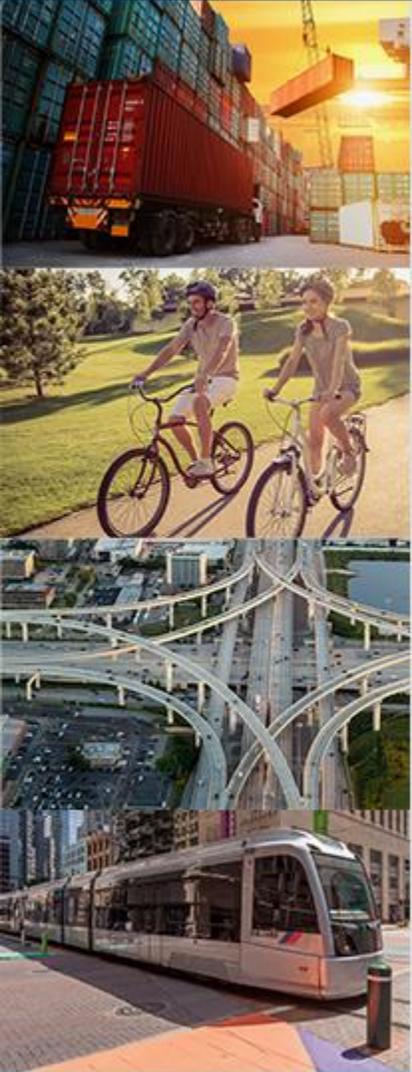
Benefit/Cost Analysis



Benefits considered by REMI:

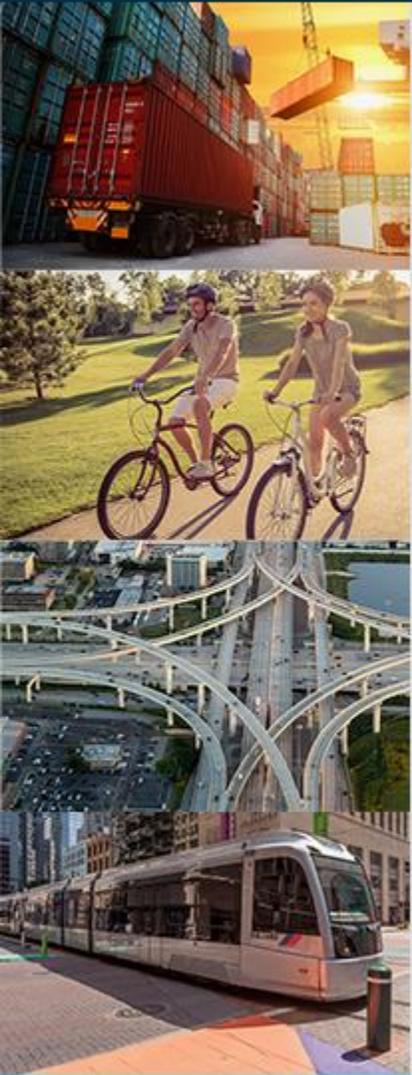
- Economic impact measurement: employment, personal income, output, regional product, property value, and productivity
- Societal (user) benefits measurement: emission reduction, safety improvement, vehicle operating cost, and value of time

Benefit/Cost Analysis



- Investments in transportation system will lead to improvement in labor productivity, production cost, commodity access, etc.
- 2040 RTP used as model baseline
- Costs and benefits converted to net present value (7% discount rate)

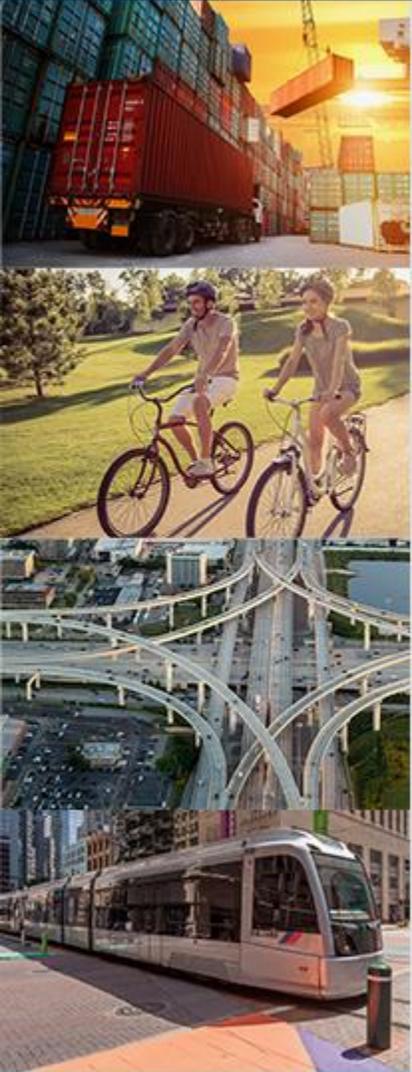
Capital Cost Scenarios



■ Low:	\$34.7 B
■ Medium Low*:	\$43.2 B
■ Medium High:	\$81.3 B
■ High:	\$100.4 B

* Closest to draft METRONext Vision Plan

Benefit/Cost Analysis

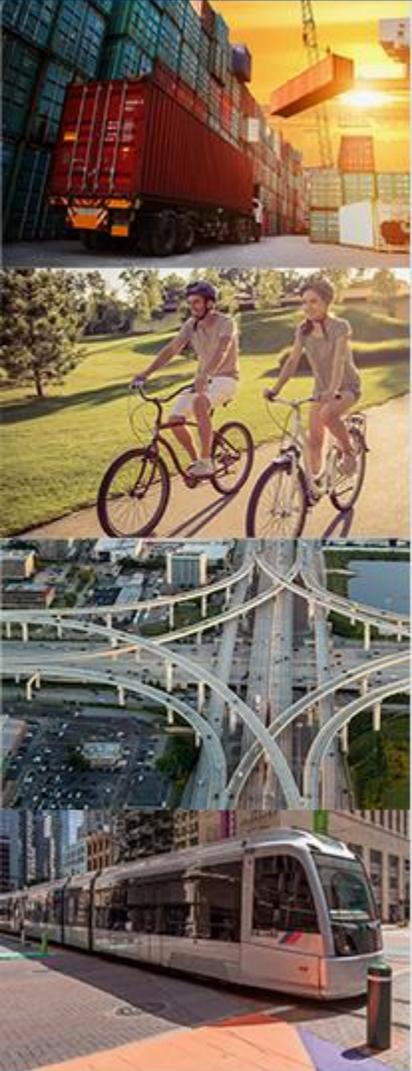


- Costs include capital and cumulative operating (2018-2045)
- Capital expenditures begin in 2022 and continue through 2030s
- Assumes that High capital scenario (full grade-separation) can accommodate modeled demand

Benefit/Cost Analysis

Economic Benefits: High Capital Scenario (above baseline, cumulative 2018-2045)

- **Employment** **+596,000**
- **Regional GDP** **+\$ 312.8 B**
- **Output** **+\$ 361.5 B**
- **Personal Income** **+\$ 174.2 B**

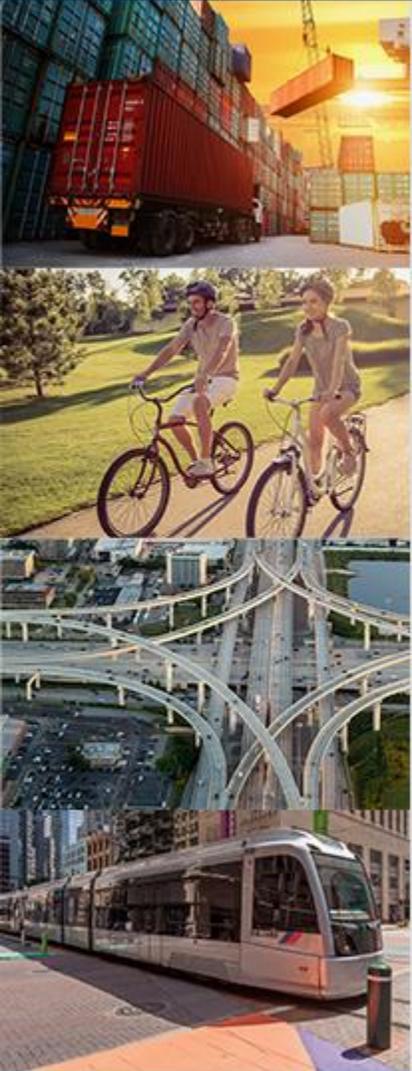


Benefit/Cost Analysis

User Benefits: High Capital Scenario

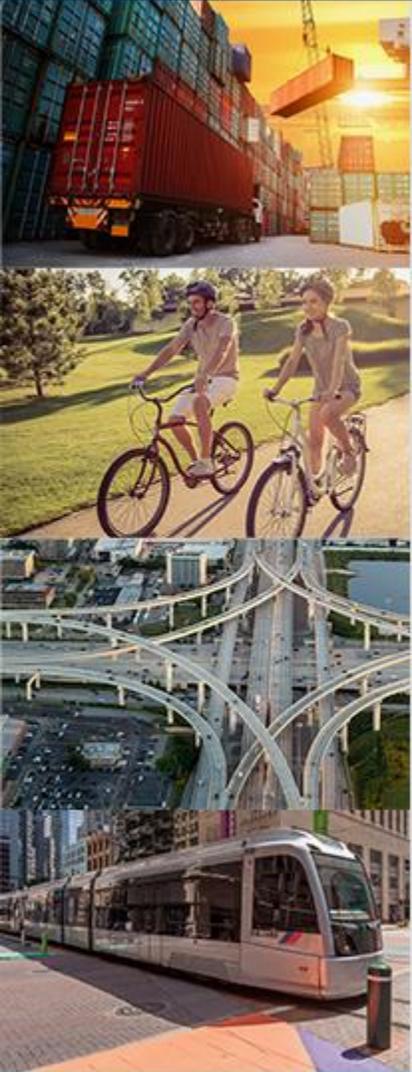
- Present Value of Personal User Benefits: \$ 88.1 B
(Travel time savings, vehicle operating cost savings, etc.)
- Present Value of Increased Personal Income \$ 174.2 B
- **Total Economic Benefit: \$ 262.3 B**
- **Present Value of HCT Costs: \$ 41.4 B**

ESTIMATED BENEFIT/COST RATIO: 6.3

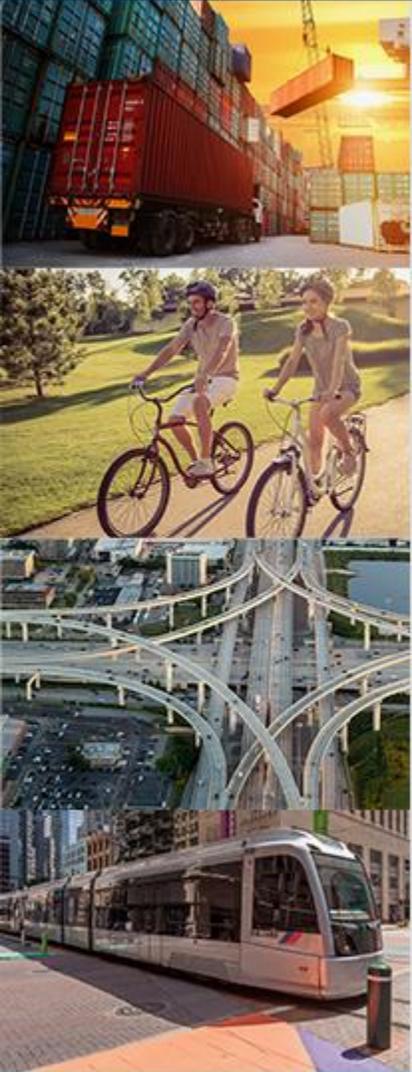


Benefit/Cost Analysis

- “High” capital scenario yields economic and societal (user) benefits well in excess of its costs
- No-build scenario had negative benefits
- B/C analysis for other capital scenarios require additional time
 - Travel demand model needs to be adjusted to assume lower ridership (speeds, capacity, etc)



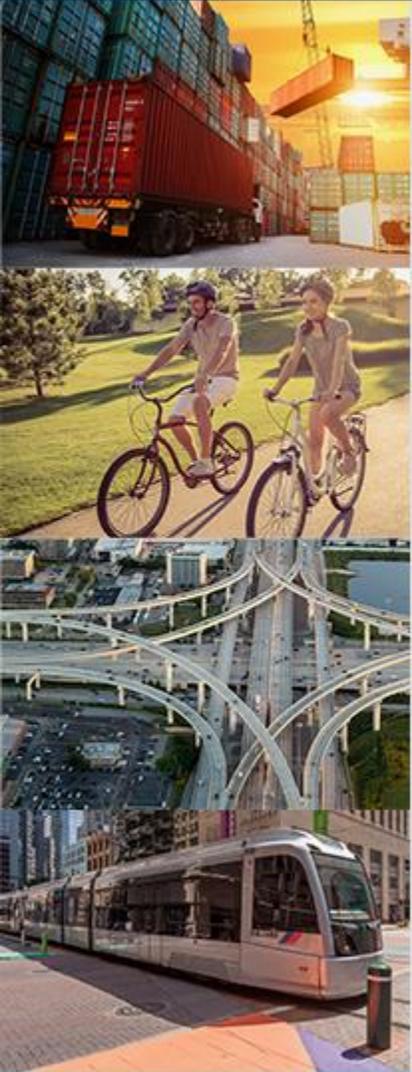
High Capacity Transit Task Force



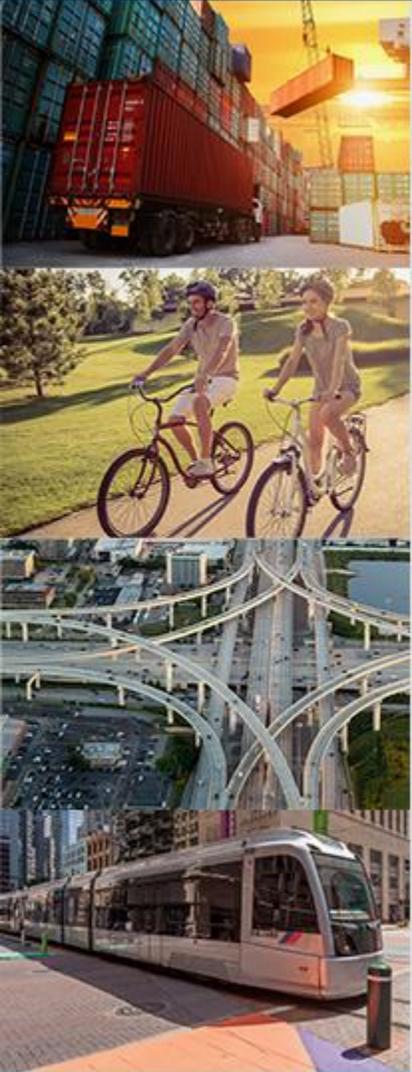
What are we missing?

Next Steps

- Continue Benefit/Cost Analysis
 - Requires travel demand model runs for other capital scenarios
- Next meeting: Friday February 15
- Finalize report and present to TPC
- Potential Inclusion into 2045 RTP
 - Public Outreach currently underway



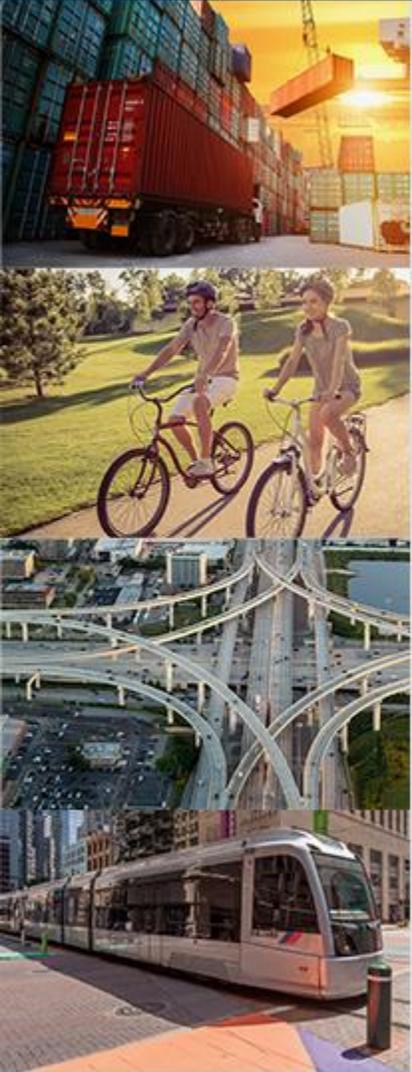
High Capacity Transit Task Force



“Make no little plans; they have no magic to stir men’s blood and probably themselves will not be realized.”

-Daniel Burnham

HCTTF Service Concepts Workgroup



**THANK YOU FOR
PARTICIPATING!!!**